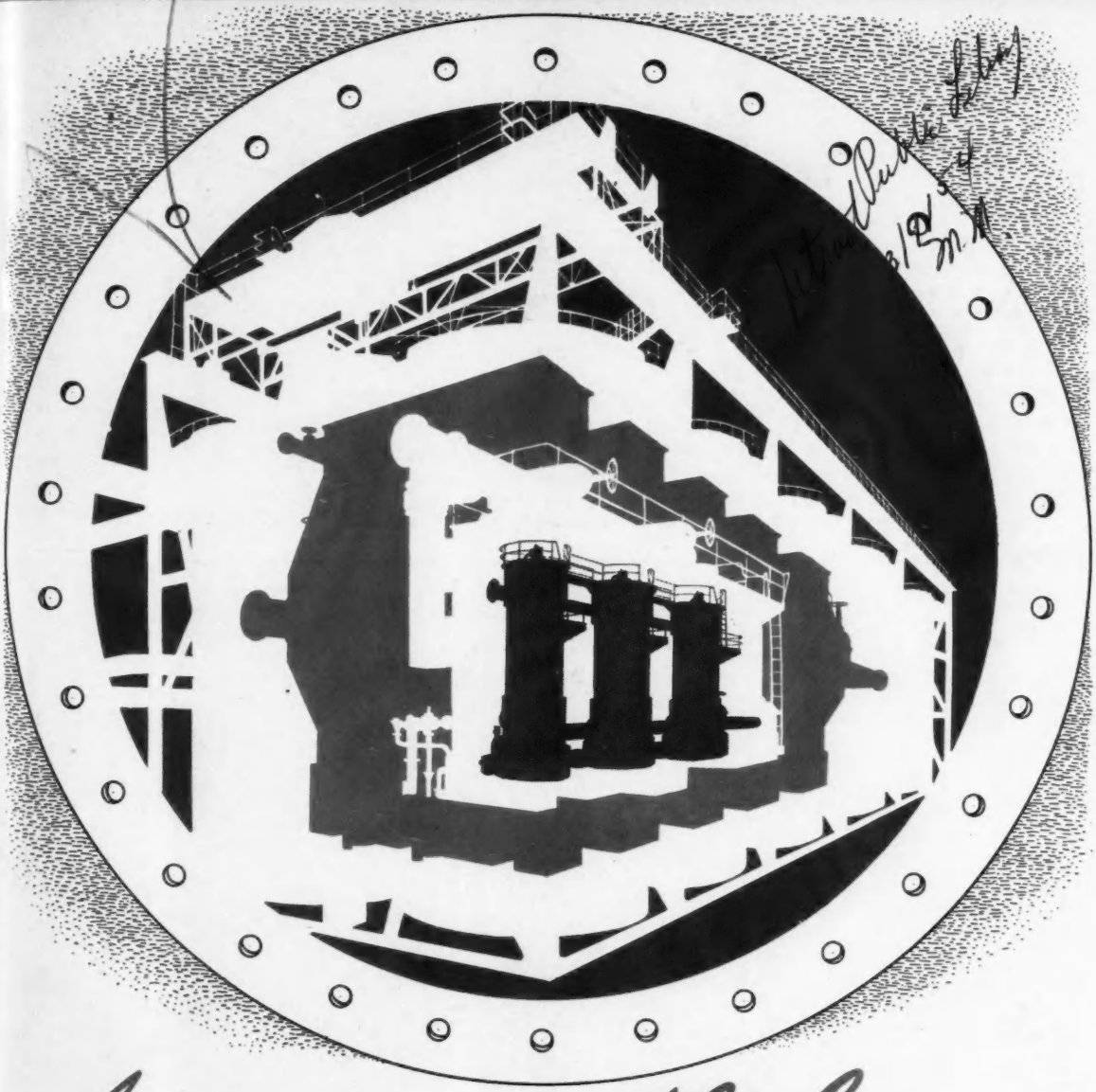
TECHNOLOGY DEPT.

Gas Journal

VOL. 277. 106TH YEAR. LONDON, FEBRUARY 24, 1954. NO. 4734. PRICE 1/3



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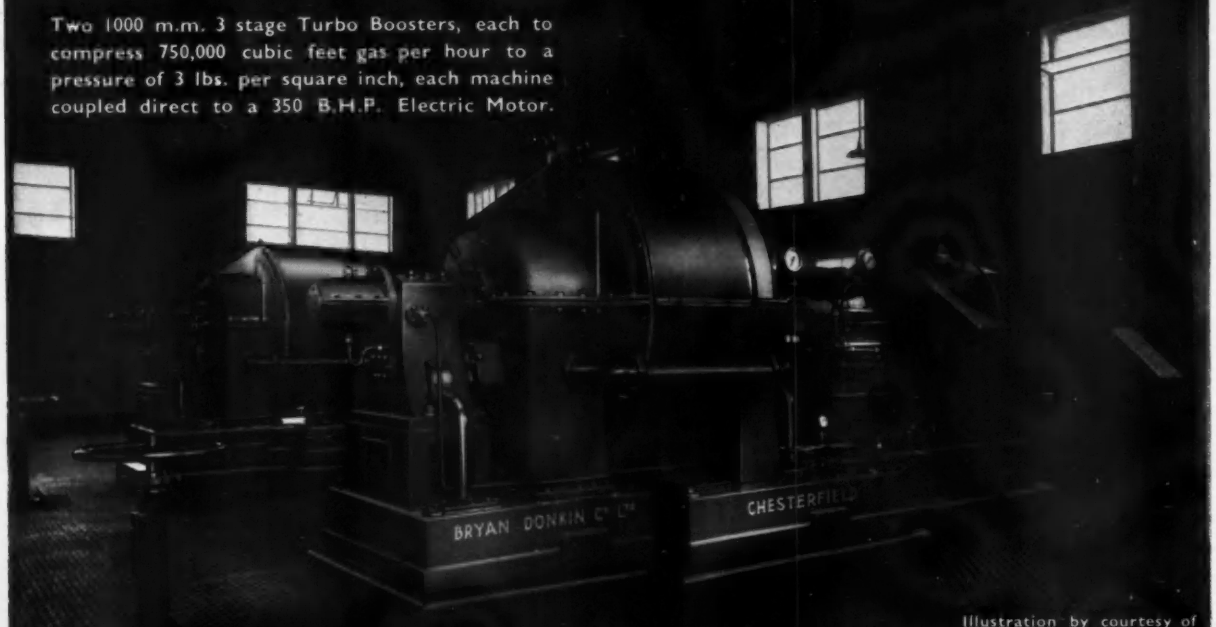

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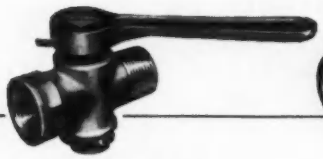
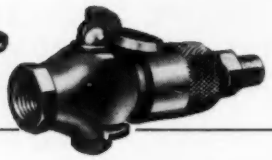


M & F Main Cock with Iron Key.



"Simflex" Drop Lever Cock with plug in Connector

9044 SE Plug in Cock and Connector (Rubber Sleeve Joint)

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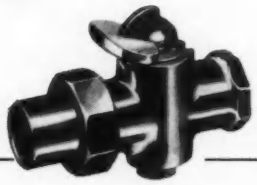
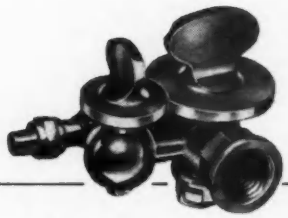


Union Cock with drop lever.

Gas Fire Cock with loose key, flanged for floor fixing.



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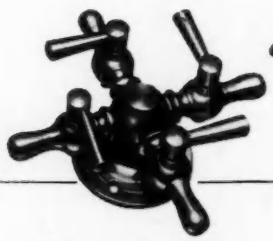
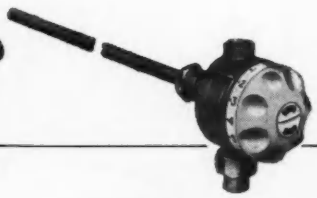


4 Way Laboratory Bench Cock, for Laboratory use.



Cooker Thermostat White plastic head with figures marked in black.

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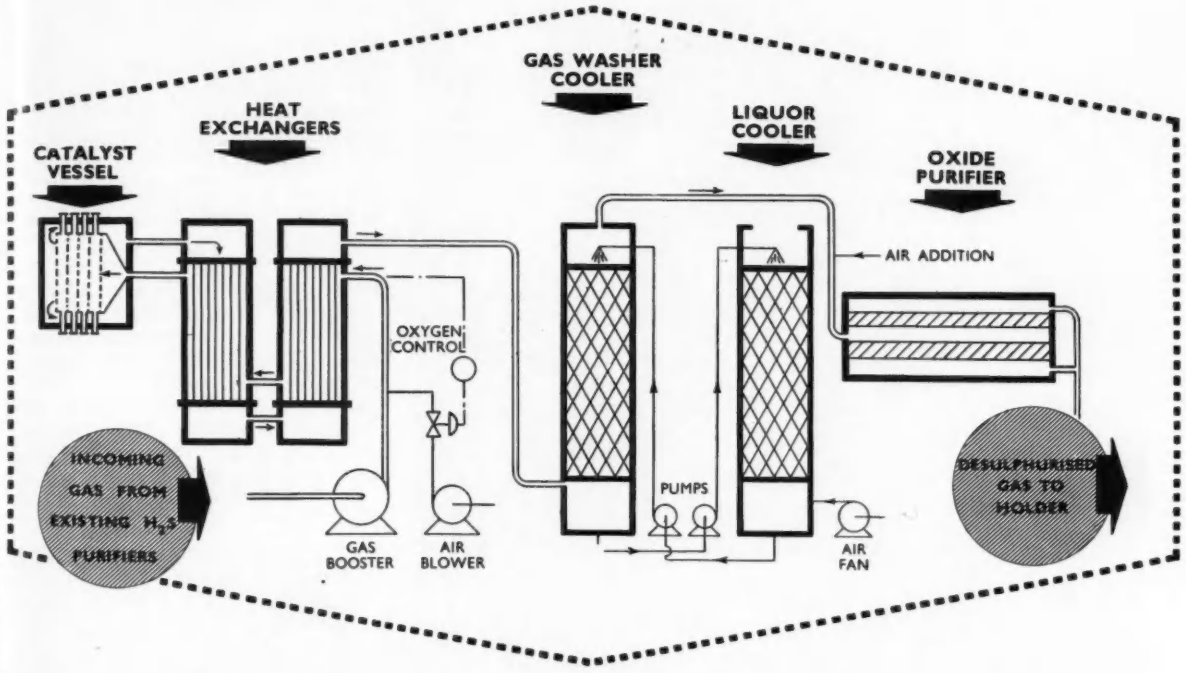
The removal of Organic Sulphur from Town Gas

WHESSOE LTD have been appointed licensees by the North Thames Gas Board for their catalytic process for the removal of organic sulphur compounds from town gas.



The advisability of reducing the organic sulphur content of town gas has long been stressed in Institution of Gas Engineers' Communications, the first in 1936, and in the Heyworth Report on the Gas Industry. Gas of low sulphur content would reduce corrosion of domestic water heating appliances, extend the field of use of flueless heaters, and remove difficulties met in special furnace applications, such as scaling in heat treatment, and bloom in glass finishing.

The North Thames Gas Board's process has been developed from the pilot plant at Fulham, to the first works scale plant of capacity 1.5 million cu. ft./day at Harrow. This plant, which has operated since 1938, has demonstrated the success and reliability of the process, which will reduce the organic sulphur content of town gas to below the recommended limit of 10 grains/100 cu. ft. without recourse to benzole extraction, or to 3-5 grains/100 cu. ft. in conjunction with a benzole plant.

Organic sulphur compounds are oxidised at 380°C. by means of the Nickel Sub-sulphide catalyst. Heat loss is minimised by lagging and by heat exchange between outgoing and incoming gas and the small heat requirement is supplied by catalytic combustion of hydrogen and oxygen, the oxygen content being controlled at 0.8—1.0%

The gas is finally cooled and scrubbed free from oxides of sulphur, the alkaline scrubbing solution being cooled and recirculated. A catch purifier is required to remove traces of hydrogen sulphide.

The process is covered by B.P.489,398 and subsequent patents.

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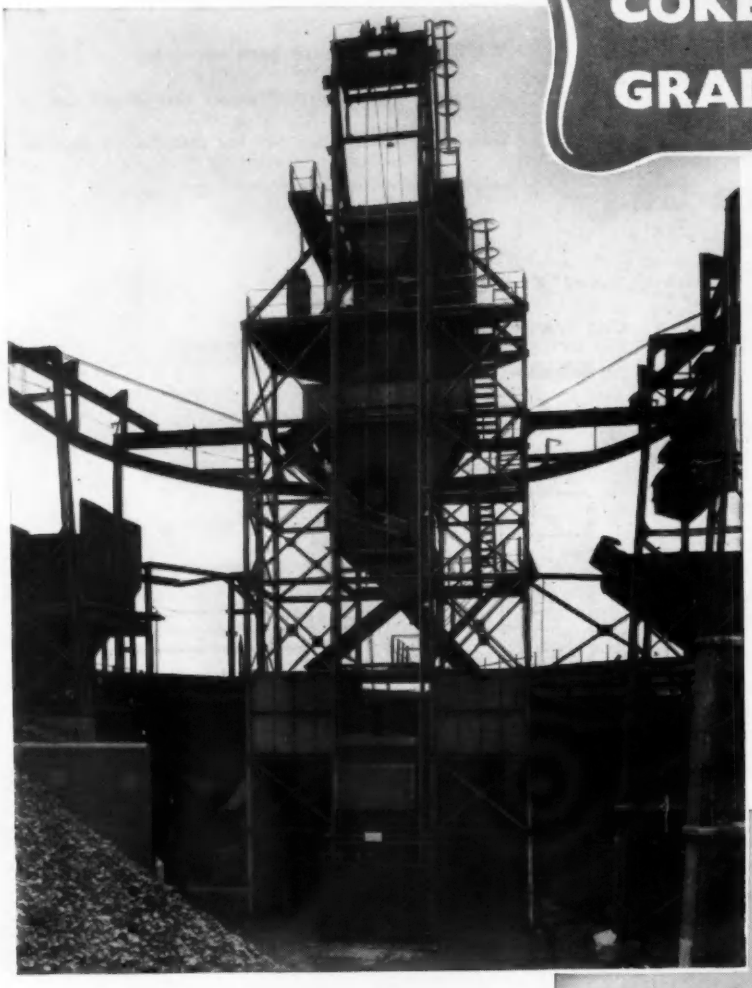
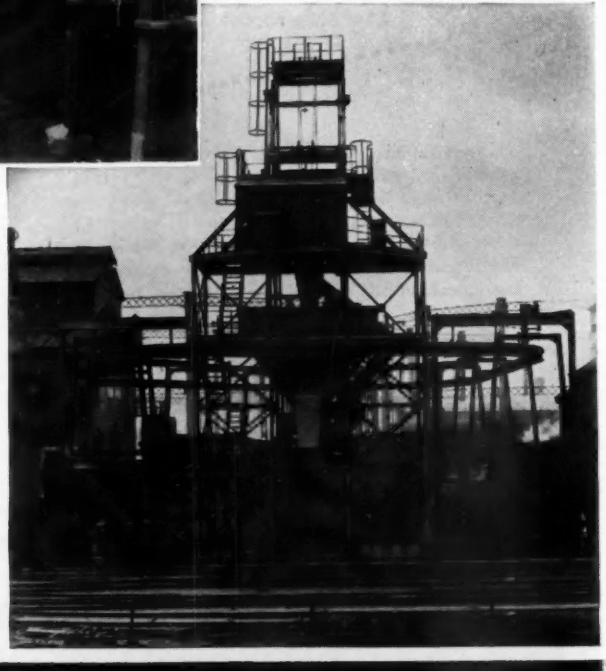
COKE HANDLING AND GRADING PLANT



COMPLETE coke handling and grading plant for the Northern Gas Board, comprising Skip Hoist, Storage Bunkers, Screens and complete supporting structure, dealing with 20 tons per hour. The Skip Hoist is of the unbalanced semi-automatic type with 18 cwt. capacity, lifting speed 80 ft. per min.

Vibratory Screens include primary screen grading coke 1½ in. and under and a secondary screen grading 1½ in.-¾ in. size and ⅝ in. and under. Bunkers include one 9½ tons capacity with chute loading direct to rail wagons, and two bunkers each 8 tons capacity with chutes for road wagon loading. All Bunkers are Gunite lined. The plant is complete with all electrical equipment and motors. Total height of structure 81 ft. above ground level.



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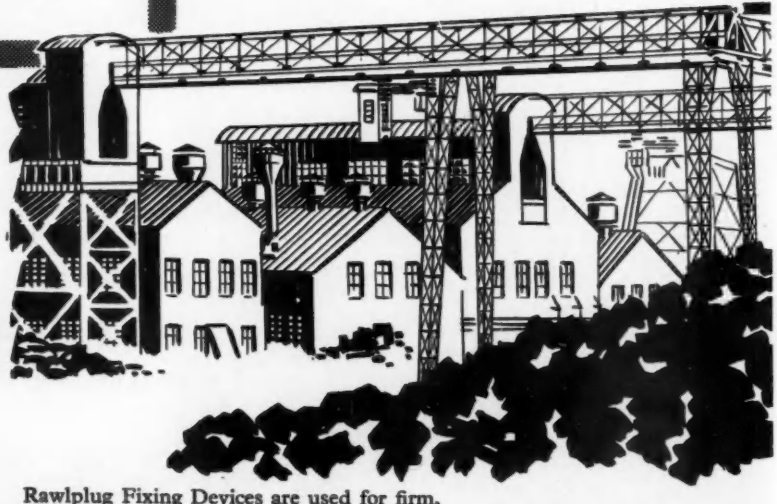

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Photograph by courtesy of the Gas Council.

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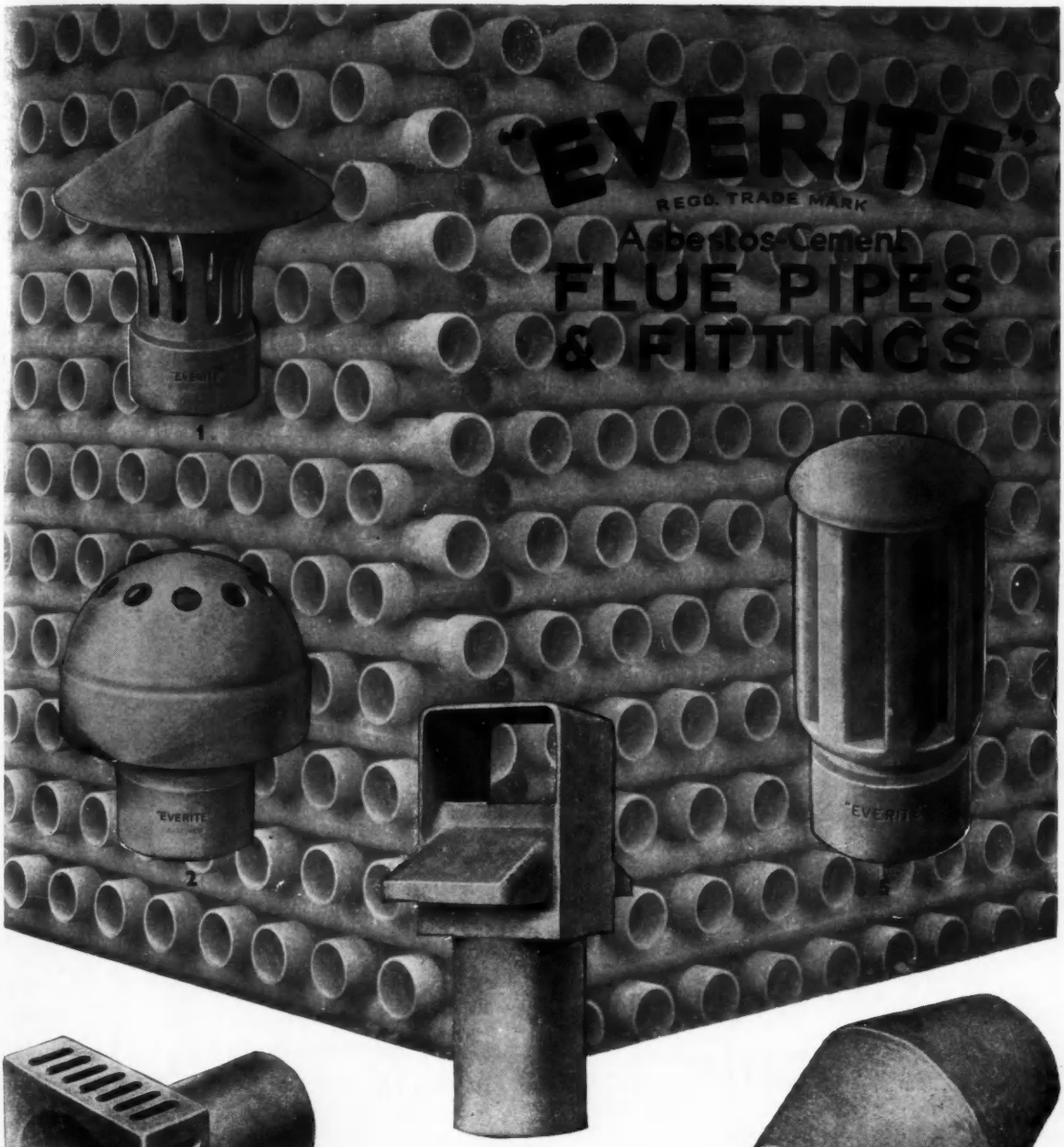

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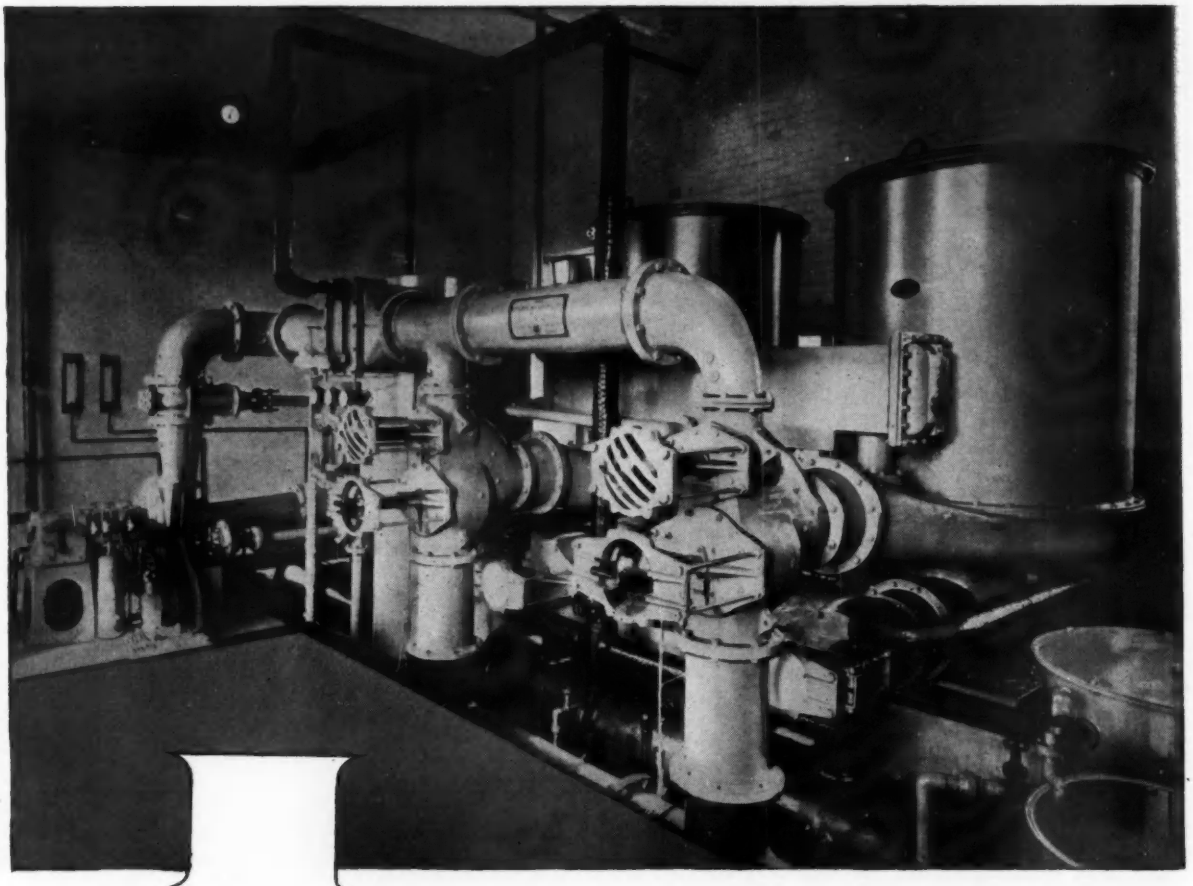

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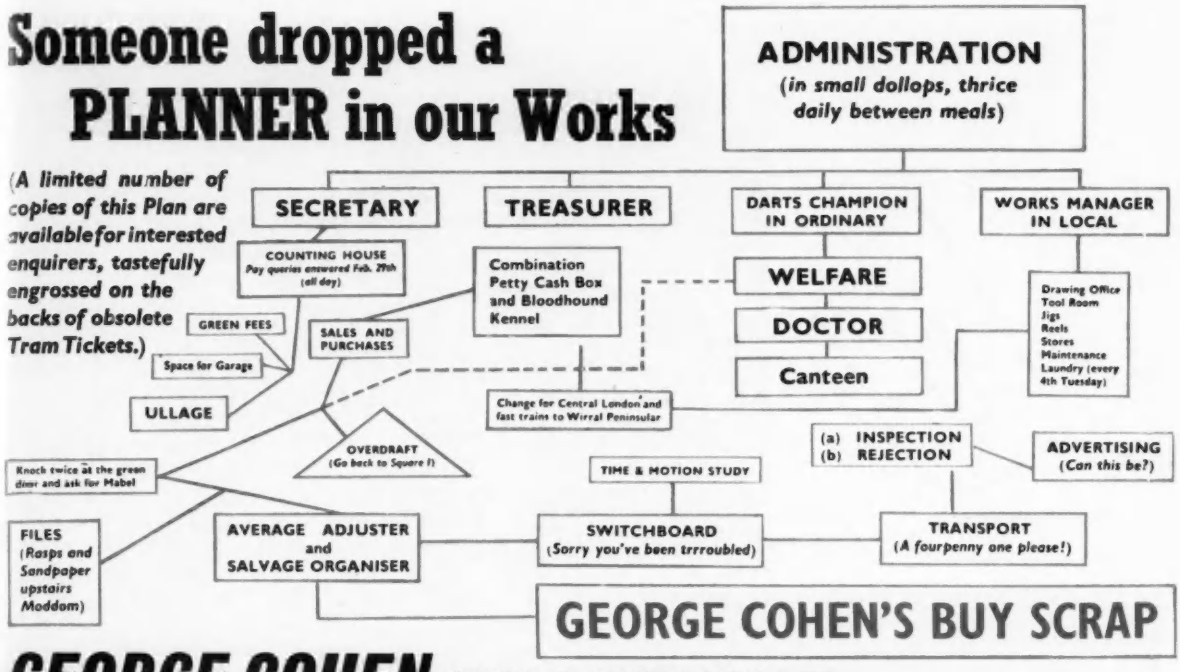

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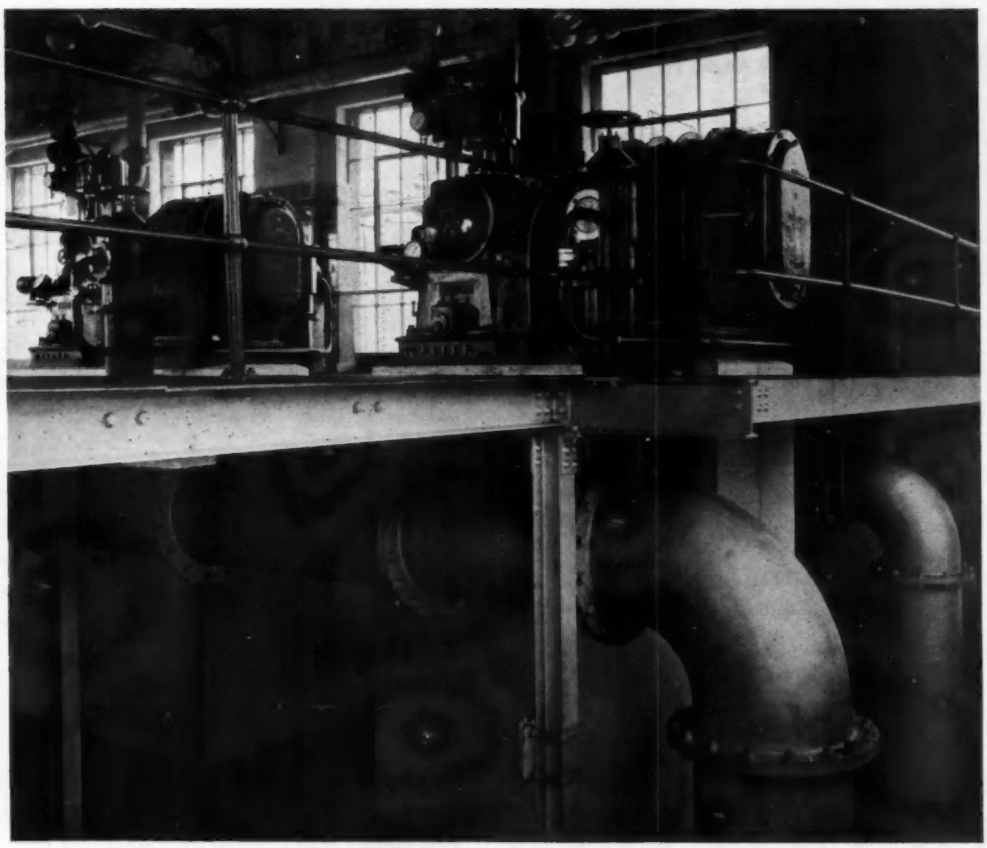

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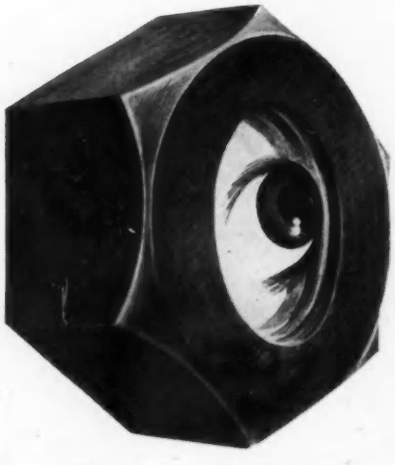

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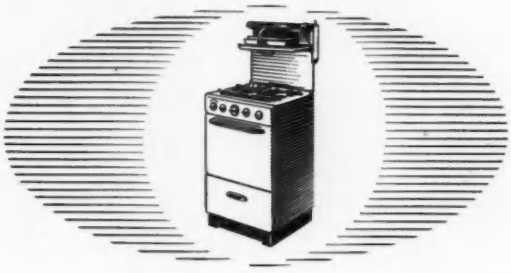

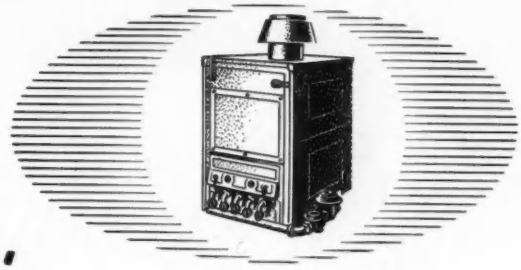

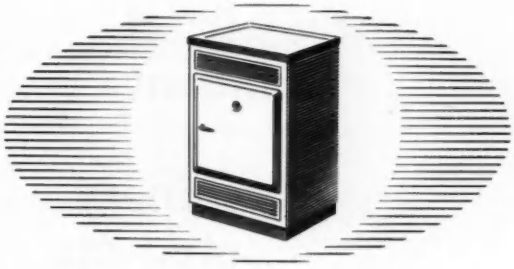

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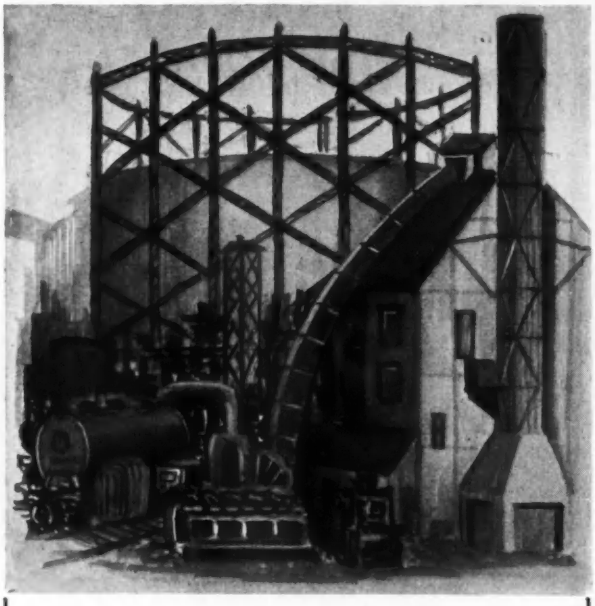

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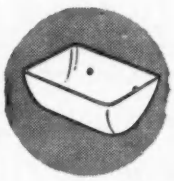

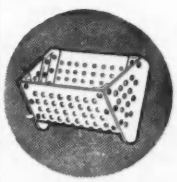

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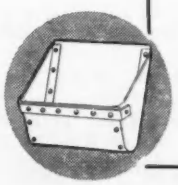

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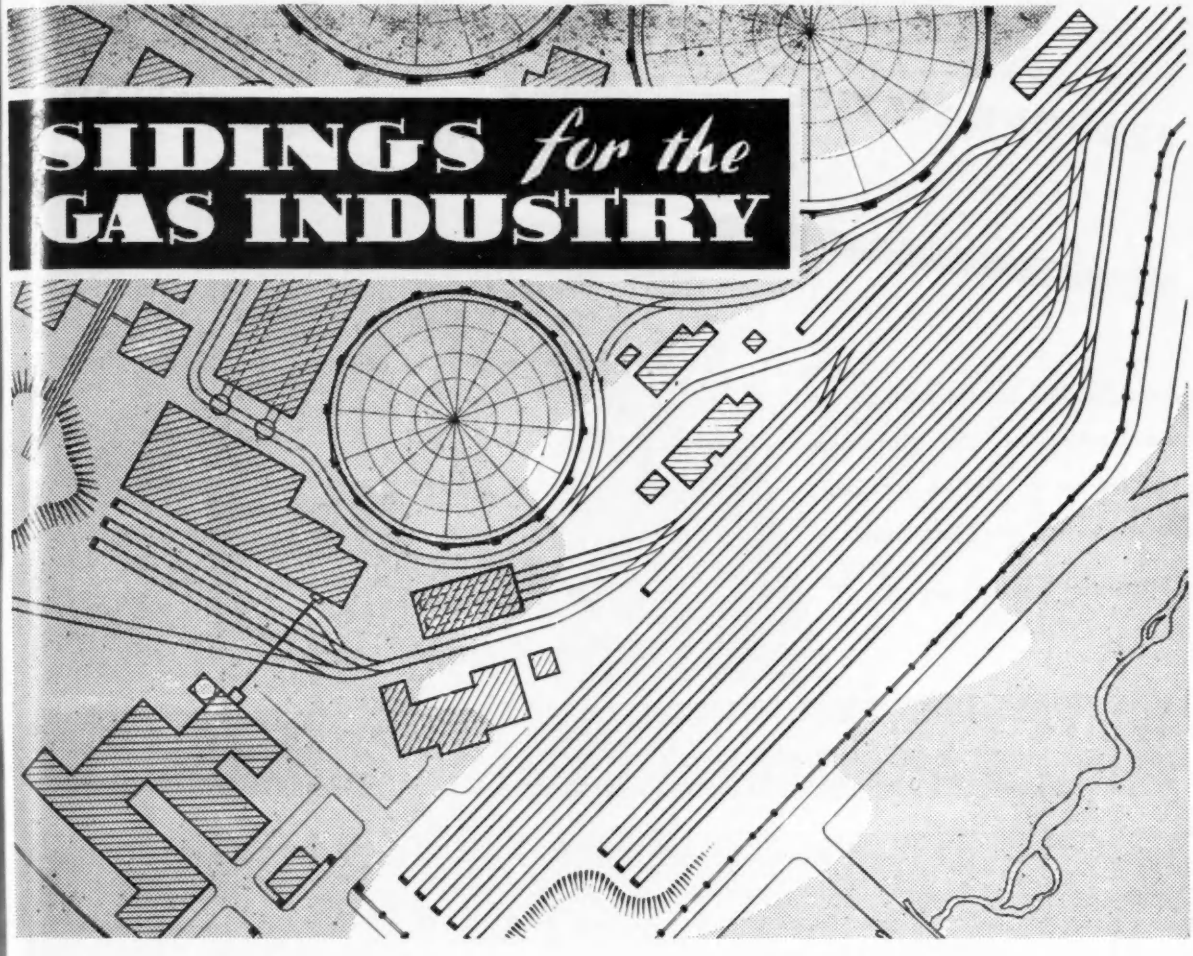

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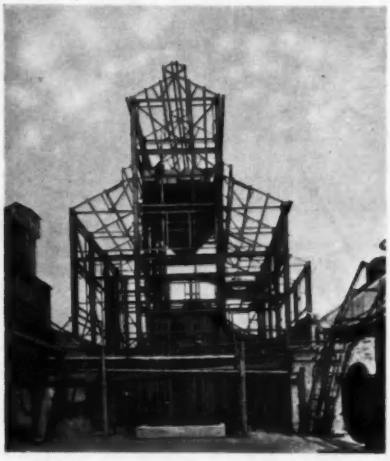

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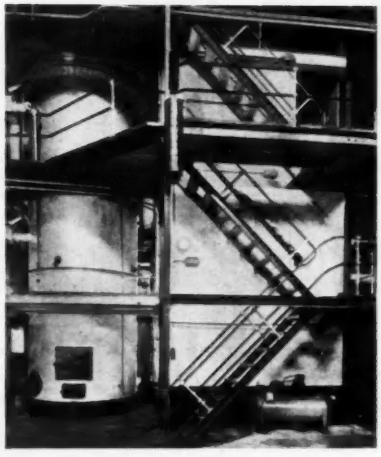

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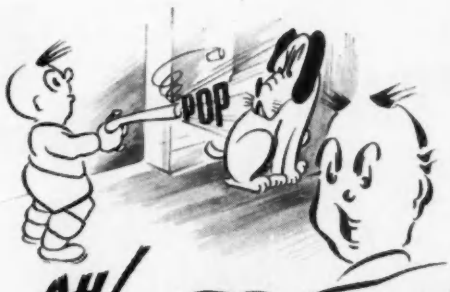

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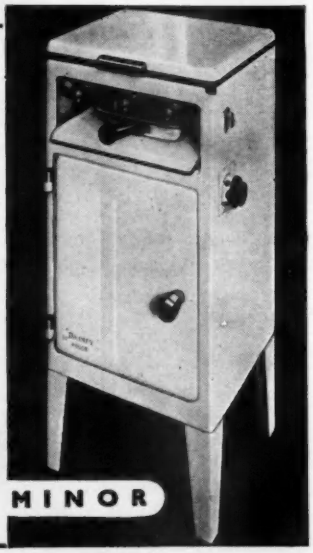

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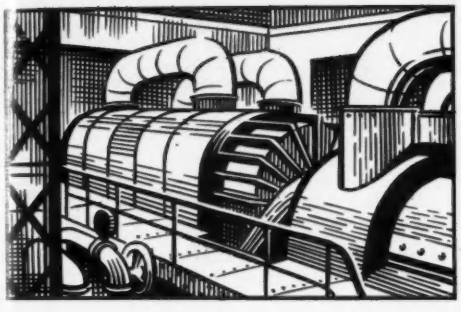

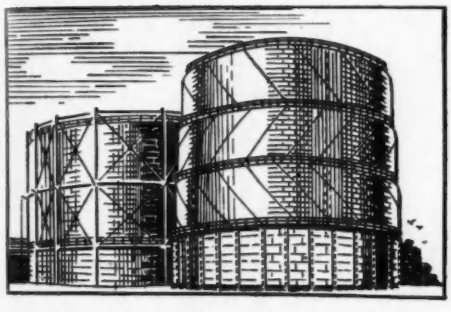

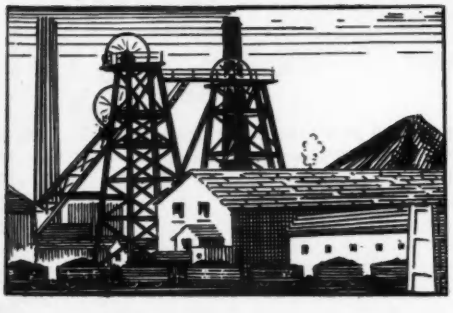

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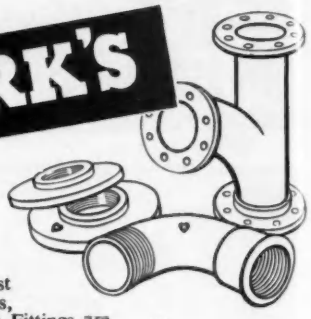

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Gas Journal

106th YEAR OF PUBLICATION

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11, BOLT COURT, FLEET ST., LONDON, E.C.4. Telephone: CENtral 2236-7 Telegrams: Gasking, Fleet.

VOL. 277 NO. 4734 February 24, 1954

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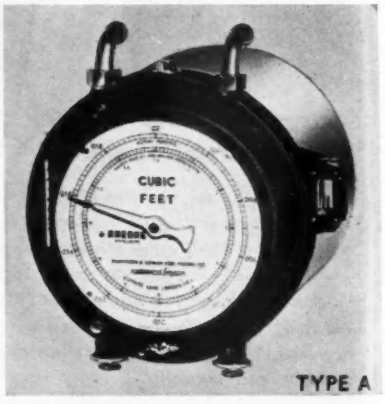

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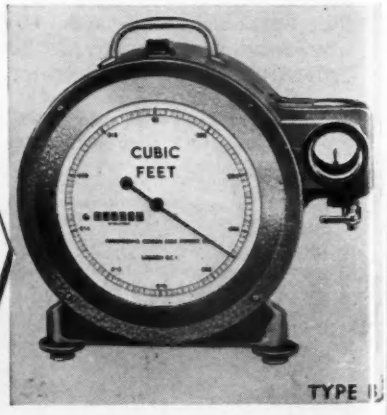

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Gas Journal

VOL. 277. No. 4734 106TH YEAR February 24, 1954

COAL PREPARATION FOR THE GAS INDUSTRY

Much has been said and written on the subject of the cleaning of coal for the market, and we have recorded fully in our pages the suggestions from time to time put forward and the progress achieved. There are many who think the progress could well have been accelerated, particularly before the 1939-45 war. Due to several factors, the problem of clean and consistent coal supplies to the gas industry was not so difficult as it has been since 1939 and, in fact, as it remains today. Ash in the coal supplied to the industry is only one quality aspect; but it is a highly important one. It directly affects the cost of gas production and the ability to market gas coke. In a hundred and one ways ash is a very real bugbear from the time the coal leaves the pithead, through the process of carbonisation, through the combustion of coke, finally to the industrial or domestic ash-bin. As long ago as 1944 a Committee of the British Coal Utilisation Research Association recommended in a report to the Ministry of Works and the Ministry of Fuel and Power that all solid fuel for domestic use should have an ash content not exceeding 6%—a proposal far beyond possibility of achievement with the coals normally supplied to the gas industry even before the war. And we have stressed on several occasions that the gas industry is under legal obligation in regard to the standard of gas supply. It should be able to purchase according to specification the coal it requires for the dual function of gas and coke manufacture.

It is true, of course, that many of our best low-ash seams are approaching exhaustion and that some producers are having to mine coals contaminated with a high proportion of middlings, the discard of which means the incurring of great waste. The subject is complicated. For example, absence of fines in coal used in vertical retorts or gas producers might be a factor worth many shillings per ton, whereas in coals for use under boilers this factor might not be worth as many pence per ton. Cleaning adds to the cost of coal a large amount per ton due to discarding part of the raw product. All coals can be cleaned if necessary down to the intrinsic ash; all coals can be prepared free from fines; but fines must be produced in winning the coal, and the greatly increased mechanisation of the mines has proportionately led to an increase in the percentage of fines.

The subject of the preparation of coal for the gas industry was discussed at a meeting—a very bright and brisk meeting—of the London and Southern Section of the Institution of Gas Engineers last week, when Mr. E. M. Myers, Coal Preparation Engineer of the Durham Division of the National Coal Board, gave a stimulating talk illustrated by slides and films. Our report of the meeting will be found on later pages of this issue of the 'GAS JOURNAL.' Mr. Myers commented that in the days of hand-hewing and filling, it was possible to 'pinpoint' the source, in the pit, of tubs containing excessive amounts of impurities, and steps could be, and were, taken to deal with such conditions. There was an incentive to the miner to get and fill clean coal. With the advent of mechanical conveying, this incentive practically disappeared. Far greater quantities of impurities are being sent to the surface, and the question and practice of coal cleaning have assumed far greater importance. In the County of Durham today preparation processes of one form or another are in operation dealing with a 'raised and weighed' output of about 30 mill. tons per annum (equivalent to about 27 mill. tons saleable). It is planned to supplement this during the next five years by the completion of washeries having an input capacity of 10 to 15 mill. tons a year; and an interesting feature of the plan is that most of the new and reconstructed plants will be so designed that they will be able to produce various sizes of coal (large, graded, or smalls) or to blend together all or any of these sizes.

Once again the author emphasised that the greatest effect on the economic price of clean coal results not from the operating cost of the cleaning plants, but from the loss of vend due to the amount of discard. Labour represents 60% to 65% of the total cost of coal at the pit head. It costs just as much to produce discard at the pit head as it does to produce clean coal. If, after passing through a cleaning plant the product represents only 80% of the amount that entered the plant, then the additional cost to the coal producer may easily run to 10s. a ton. These are bald facts. The cost of cleaning is passed on to the consumer. During the discussion, Dr. J. Burns, Chairman of the Section, remarked that, 'within reason,' the gas industry was prepared to pay more for a better product. And he introduced a note of optimism in mentioning that for the first time since the war the total inerts in the coal supplied to the North Thames Gas Board were lower in 1953 than they were in 1938. True, the decrease was small; but it is a move in the right direction.

TOWARDS BETTER LIVING

Mr. Gerald Nabarro, M.P., among whose many activities is that of Joint Secretary of the Conservative Parliamentary Fuel and Power Committee, pursues with great energy and determination his laudable crusade in the cause of the best all-round deployment of our national fuel resources. Apart from his rousing speeches in the House, already the list of his addresses to societies both technical and non-technical is formidable; and we are sure that his forceful advocacy is having most beneficial result in stimulating and maintaining thought on the subject. Mr. Nabarro's latest talk was at this month's lunch of the Coal Industry Society. We reported the talk in last week's 'JOURNAL.' He congratulated the National Coal Board on exporting 14 mill. tons of coal in 1953. It was, however, congratulation accompanied by qualification. We ought, he contended, to have exported 35 mill. tons. The frustrated coal exports represented a net loss of more than £100 mill. This frustration, he argued, was due to the amount of coal we use heedlessly in Great Britain today. Points which Mr. Nabarro did not make were that, in spite of mechanisation of the mines, the output per man-shift remains practically the same; cost is increasing; neither quantity nor quality of coal is being improved.

The Ridley Committee put the shortage of coal in British industry generally by 1960 at 25 mill. tons a year. Mr. Nabarro—leaving out any contributions that may be forthcoming from atomic energy and other sources of power—suggested that this estimate is wrong. Shortage cannot be less than 30 mill. tons. For electricity generation alone there would, he argued, be needed, by 1961, 15 mill. tons more coal per annum, making a consumption of 50 mill. tons per annum in that one industry alone. And he said this not because he was one of those who believed that 30 to 40 years would elapse before we could put fission to useful purpose (incidentally, Mr. Nabarro is Vice-Chairman of the Conservative Parliamentary Atomic Energy Committee). 'Long before that,' he said, 'Britain will be producing substantial quantities of electric power without the use of coal or water . . . The construction of the first atomic power station in Britain is well advanced. It is a big one . . . We are building-up a great new industry in atomic energy.'

The gas industry is faced with competition. This is no new phase in its history; and much depends, as we have discussed on a previous page, on the supply of coal suited to its needs and the requirements of the community. The public conscience has been roused to the desirability of a cleaner atmosphere. Bradford Corporation has just approved an order that in about a year's time will make 20 smokeless zones. Nineteen of them are residential—they are council estates where the burning of smokeless fuel is already a condition of tenancy. The other is in the centre of the city where business premises will be involved. On estates that are expanding, more than 4,000 tenants will soon find that they must burn smokeless fuel or run the risk of a penalty. There is doubt in Bradford whether supplies of coke are adequate to meet demand. Bradford's doubt about coke supplies is unwarranted. The Corporation has, in fact, been assured by the Ministry of Fuel and Power that supplies will be large and regular enough to justify the Council's action. Coke is, of course, off the ration, and stocks are high. Success of the scheme—and it applies to all other such schemes—depends on correct installation of the right type of appliance and assurance regarding the quality of coke supplied. Compliance with these two basic principles will result in economy to the householder and economy to the nation by lessening the smoke evil and by using coal to the best advantage.

SULPHURIC ACID PRODUCTION

We do not refer here to atmospheric pollution, to the extent to which 'nutty slack,' or gas coke, or the sulphur in town gas liberally adds to national expenditure. We are concerned, rather, with sulphuric acid as such in a form which can be used economically and to good advantage. With a make during the last quarter of 512,775 tons, the United Kingdom production of sulphuric acid for 1953 reached 1,875,177 tons—an increase of some 370,000 tons on output in 1952 and of some 270,000 tons on 1951, the period of acute sulphur scarcity. The rise in acid production last year was due partly to the more intensive rate of working of the plants in the industry and partly to the coming into commission of new plants, and the increase has been proportionately greater—from 933,366 tons in 1952 to 1,216,652 tons in 1953—in plants operated by the contact process.

SCOTTISH PEAT RESOURCES

In a report issued last week the Scottish Peat Committee estimate workable deposits of peat at 600 mill. tons, equivalent to 500 mill. tons of coal, or 20 years output in Scotland. Development of the major peat lands might provide employment for 20,000 people for 100 years, mainly in the Highland counties. The Committee was appointed in 1949 to examine the possibilities of developing Scottish peat deposits. On the question of reclamation the report is most interesting. It is, for instance, believed that at Altnabreac, Caithness-shire, once the peat has been removed, about 10,000 acres of arable and pasture ground might be created which, together with 30,000 acres of rough grazing and 2,000 acres of plantations for shelter belts, might support 80 family farms, with a population of 400. The Committee recommends that the North of Scotland Hydro-Electric Board should receive financial assistance from the Development Fund to establish a peat-burning power station at Altnabreac.

FULL, SLOTTED AND DOTTED LINES

A 'Typical Tree of Opportunity' has been prepared by the Gas Council, and is presented as a centre spread in an uncommonly effective booklet, *A Career in the Gas Industry*, which the Council has just published. 'Not too little; not too much,' was part of the slogan of a firm which makes lather for the masculine face. As a piece of propaganda—educative instruction—*A Career in the Gas Industry* toes the golden mean. The 'tree' which we have mentioned branches out from the Chairman of the Board, and the branches carry many highly-prized and highly-priced blooms. The Gas Council booklet, however, is concerned with blossom-time. Full lines on the chart of solution indicate established channels of progression from, say, laboratory assistant to Board Chairman; the slotted lines indicate 'possible' channels of progression; the dotted lines indicate 'possible' channels of progression for exceptional candidates. It is largely to clarity and brevity that *A Career in the Gas Industry* owes not only its punch but also its appeal. The scope for the scientist, the engineer, the accountant, and the administrator is well portrayed in outline. Pupilage schemes, proved by experience, are

described, and the whole approach to the subject is admirably fresh. Today the gas industry employs, in round figures, 147,000 persons. Obviously the Gas Council and the 12 area boards cannot have more than 13 executive chiefs, but the Gas Council's new booklet delineates the path to promotion, the whole demonstrating in word and picture the gas industry's present strength and future potentialities. Copies may be obtained from gas boards or through the Youth Employment Offices of the Ministry of Labour.

CONTRACTORS AND ACCIDENT PREVENTION

Every accident prevented is a gain to industry, and while the ultimate target is the abolition of accidents, a result unlikely to be achieved in measurable time, some approach can be made towards the millennium by the exercise of tact, patience, common sense, and determination. The London Building and Engineering Contractors' Accident Prevention group, under the Chairmanship of Mr. W. Dawes (Woodall Duckham Company) has made safety its special study, and at its ninth meeting last month the members heard a helpful talk by Mr. R. G. Thomson, Secretary of Builders Accident Insurance, Ltd., on the duties of safety officers, some oddities of the building regulations, and common queries arising out of accident prevention work generally. Answering the delicate question as to why insurance companies settle claims sometimes when there is no liability, he said it was usually good sense to settle cheaply, as it cost on average £250 to £300 to win. The odds are always on the claimant, and some companies are scared to fight in present circumstances. Another common query is why old servants who have had nothing but good treatment make speculative claims. Mr. Thomson thinks they are persuaded that the money does not come out of their employers' pockets, and anyhow the employer is only getting benefit for which he has paid. It is not true, but it works, and the employer himself cannot get it out of his head that he is insuring for benefits; some employers seem to think that if they are insured they can dodge all safety measures. Mr. Thomson gave warning that disabled men should be engaged only for certain classes of work. 'You can employ a man in all fairness if he can do the job,' he said, 'but as safety officers you should tell your employers and persons in charge that they must not give him any work to endanger himself in his condition, or other workmen nearby. If a man has lost an eye you must make sure that whatever job he does will not impair his remaining sight. If you take a man on and he is involved in an injury you are doubly guilty, and the court would say so.' Mr. Thomson's talk provoked a lively discussion and yielded some useful safety suggestions.

THE ART AND PRACTICE OF BLENDING

A paper presented yesterday to the Institute of Fuel by Mr. H. Bardgett, of the Fuel Research Station, D.S.I.R., outlined the results of experiments on the carbonisation of blends of Durham and Northumberland coals in Woodall-Duckham intermittent vertical chambers. The work indicates to what extent it may be possible to conserve our limited resources of the best coking coals by blending them either with low-rank coals or with gas coals in the production of metallurgical coke. With suitable choice of carbonising conditions, it is concluded from the trials that cokes produced in the intermittent vertical chambers at the Fuel Research Station compare closely in physical properties, other than size, with cokes produced in commercial ovens from similar coals. A weakly-caking high-volatile Northumberland coal can be blended with Durham coals, Types 301, 401, and 501, to the extent of 50%, 30 to 40%, and 40% in producing coke of 2/1½ in., shatter indices of 80/90 and of Cochrane index not below 74. Durham coal, Type 501, can be blended in any proportion with Durham coals, Types 301 and 401, to produce coke of satisfactory properties. With the coals and blends used, reduction of coking rate within the limits 1.0 to 0.7 in. per hour improves appreciably the coke strength, but 'soaking' has little effect. A Durham 'cinder' coal, affected by igneous intrusion, can be used to the extent of 20% to 25% in blends with Durham 401 coal without effect on the strength, and with increase of size, of the coke produced.

DEEP DRILLING FOR NATURAL GAS

Deep drilling for natural gas has begun at Cousland, near Dalkeith, Midlothian, Scotland, as part of the Gas Council's five-year search. The presence of natural gas in this area is known as a result of borings made before the war, but further drilling is necessary to establish the extent of the reserve. This is the first deep drilling to be undertaken by the D'Arcy Exploration Company on behalf of the Gas Council, although preliminary survey work has been proceeding for some weeks in Yorkshire, Lincolnshire, and Sussex.

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Personal

MR. ALEXANDER MCDONALD, B.SC., M.I.C.E., has been appointed to the position of Secretary of the Institution of Civil Engineers to succeed MR. E. GRAHAM CLARK, C.B.E., M.C., M.SC., M.I.C.E., who will be retiring this year.

MR. F. J. ROBINS has been appointed to the Board of Major, Robinson & Co., Ltd., of 'Scols' Works, Manchester, as Sales Director. Mr. Robins has been associated with the Company for some considerable time on the sales side. Born in 1912, an Oxford Graduate in Economics, he served throughout the war as a Captain in the Royal Artillery, seeing considerable service in the Middle East and South European campaigns. Mr. Robins is in charge of the London Office at Evelyn House, 62, Oxford Street, W.1 (T/N: MUSeum 5229).

MR. W. J. CUTLER, Gas Engineer, Springs, South Africa, has resigned his position with the Springs Municipality and joined the Power-Gas Corporation, Ltd., of Stockton-on-Tees. Mr. Cutler was responsible for supervising the erection of the new gasworks at Springs, together with the design and installation of the distribution system and inauguration of the first gas supply to that town. The sales of this new undertaking, which only commenced operating in March, 1953, have already reached nearly 80 mill. cu.ft. per annum. Mr. Cutler, who returns to the United Kingdom in March, will be taking up his new duties early in April.

MR. W. LAWSON HURDMAN, Director and General Manager of the Parkinson Stove Co., Ltd., Stechford, left London Airport on February 18 for an extensive tour covering both the North and South of America. The purpose of the visit is to promote the sale of products of the Parkinson and Cowan Group overseas and to consolidate their position in markets where they are already established. As Mr. Hurdman spent some years in South America, and knows the country well, the part of the tour which includes Columbia, Venezuela, Peru and Argentina will be of particular interest to him. He will also visit New York, Pittsburgh, Cleveland, and Toronto.

Mr. J. E. DAVIS, who is succeeding Mr. D. Cleave Cross as the nominated representative of the Institution of Gas Engineers on the Council of the Institute of Fuel, entered the gas industry in 1920, when he joined the South Metropolitan Gas Company. After serving successively as District, Works, and Research Chemist, he became Assistant to the Joint Manager in 1935, and Assistant to the General Manager in 1937. On nationalisation, he was appointed Chief Technical Officer to the South Eastern Gas Board. He is a Fellow of the Royal Institute of Chemistry and of the Institute of Fuel. Mr. Davis was a member for a number of years of the Joint Research Committee of the Institution of Gas Engineers and Leeds University, which later became the Joint Research Committee of the Gas Research Board and Leeds University, and was Chairman from 1946 to 1952. In the Coronation Honours, 1953, Mr. Davis was appointed an Officer of the Order of the British Empire in recognition of his services to the gas industry.

Obituary

MR. FREDERICK INCE-JONES, formerly for about 20 years a Director of the old Northampton Gaslight Company, died on February 16 at the age of 70. He was for many years headmaster of a private school for deaf boys in Northampton.

MR. J. E. STEPHENSON, South Western Area sales representative for Radiation Group Sales, Ltd., died suddenly on February 13. He had been in the service of John Wright & Co., Ltd., for 19 years before the formation of Radiation Group Sales, Ltd., in 1950. He was aged 47 and leaves a widow and daughter.

Gas Board Protest

The Scottish Gas Board has protested to Bathgate Town Council against the latter's decision to have electrical cooking facilities only at the new Boghall housing scheme. This decision was reached at the previous meeting of the Council when it was decided that in future the tenant of each new municipal house will provide his own cooker, and the Council decided to accept the offer of the South Eastern Scotland Electricity Board to supply electric cookers to tenants on a hire system. The Council hopes to save £35 per house by adopting the new scheme—the price of the cooker.

Registering its protest against this alleged discrimination in favour of electricity, the Gas Board in a letter read to the Council at a recent meeting made a plea that freedom of choice of cooker facilities should be given tenants. The Board stated that it, too, operated a hire system which gave the housewife greater choice of models and which provided superior cooking facilities to those offered by electrical cooking appliances. The Board offered to lay gas mains from the town to the new scheme free of charge if the Council would make the service connection from mains to house at a cost of £56 5s. per house.

The Council, after hearing and discussing the protest, decided to adhere to its former decision that only electrical cooking facilities will be installed at Boghall. Provost Hunter expressed the view that the day of gas was past and that the modern preference was for electricity. He could see no point in providing both mediums to the houses. If there was to be freedom of choice it would have to be done at the outset and would add to the cost of the houses.

Ex-Provost Jeffrey thought that in favouring electricity the Council were keeping an eye to the future. If there was the expected development of atomic power in the near future, obviously electric power was a thing of the future and gas would become outdated.

Bailie Shanks expressed surprise that two nationalised services should be competing to such an extent. It seemed logical to him that the aim should be to develop one efficient means of fuel and power. The Gas Board had not always been so ready to accommodate the Council, and had not yet explained why gas was dearer in Bathgate than it was in Edinburgh.

Derby Corporation is to spend £18,000 on a block of gas-heated banana ripening rooms for the town's fruit and vegetable market.

Diary

Feb. 25.—NORTH THAMES G.C.C.: Westminster City Hall, Charing Cross Road, London, W.C.2. 2.30 p.m.

Feb. 25.—SOCIETY OF CHEMICAL INDUSTRY: Second Hodsman Memorial Lecture, 'Science and Coal,' D. T. A. Townend, Director-General, British Coal Utilisation Research Association. Leeds University. 7 p.m.

Feb. 27.—MIDLAND JUNIORS: Annual Dinner at Dudley.

Feb. 27.—YORKSHIRE JUNIORS: Short Paper Day: 'An Intermediate Pressure Main,' E. C. Burkett (York); 'The Scrubber Stand-Pipe System,' R. T. Mason (Huddersfield); 'The Application of a Down Jet Coke Burner to a Series 3 Ideal Gas-fired Boiler,' J. N. Walker (Huddersfield-Halifax Group). Gas Showrooms, St. Leger Place, Doncaster. 2.30 p.m.

March 2.—MIDLAND JUNIORS: 'Underground Gasification,' G. Hart. Staff Messroom, Council House, Birmingham.

March 2. — SOUTH EASTERN G.C.C.: Caxton Hall, Westminster, 11 a.m.

March 2.—EAST MIDLANDS G.C.C.: Victoria Station Hotel, Nottingham. 11.30 a.m.

March 2-27.—IDEAL HOME EXHIBITION. Olympia. Gas Council Exhibit.

March 3.—LONDON JUNIORS: Visit to Waddon Works of the South Eastern Gas Board, and then to Crawley New Town. Assemble Waddon Works 11 a.m.

March 3.—SOUTH WESTERN G.C.C.: 34, Bridge Street, Taunton, 11 a.m.

March 3.—SOUTHERN G.C.C.: Olympia, 75, London Street, Reading. 2.30 p.m.

March 6.—SCOTTISH JUNIORS: Joint Meeting of Eastern and Western Districts at Glasgow. Paper by W. K. Hutchison, Chairman, South Eastern Gas Board.

March 11.—NORTH WALES JUNIORS: Chairman's Day. Visit to Point of Ayr Colliery. Paper by J. Woodcock.

March 12.—MANCHESTER AND DISTRICT SECTION, I.G.E. Ordinary Meeting, Manchester.

March 12.—LONDON JUNIORS: Short Papers. 178, Edgware Road, London. 6.30 p.m.

March 15.—EASTERN G.C.C.: Connaught Rooms, Great Queen Street, Kingsway, W.C.2.

March 16.—EASTERN JUNIORS: Competition Papers at Lincoln.

March 16.—MIDLAND JUNIORS: 'Integration Problems.' F. L. Atkin. Staff Mess Room, Council House, Birmingham.

March 16.—LONDON AND SOUTHERN SECTION, I.G.E.: 'Suiting Our Times, a Commercial Opinion.' G. H. W. Madge, North Thames Gas Board, 17, Grosvenor Crescent, S.W.1. 2.40 p.m.

March 20.—YORKSHIRE JUNIORS: 'Use of Liquefied Petroleum Gases for Town Gas Enrichment,' J. G. Gaunt, Deputy District Engineer and Manager, Spenborough. At Sheffield.

March 22-26.—FACTORY EQUIPMENT EXHIBITION. Horticultural Hall, Westminster. Gas Council Exhibit.

March 24.—MANCHESTER JUNIORS: Joint Visit with North Western Salesmen's Circle to Stoves, Ltd., Rainhill.

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The 'Main' refrigerator, an absorption-type model, is manufactured under both Swedish and British patents, held on unrestricted licences for the exclusive manufacture and sale in the United Kingdom, the United States, and many Dominions and Colonies. Main Refrigeration, Ltd., is working in close collaboration with other licensees of the Swedish patents who are manufacturing similar refrigerators on the Continent. These licensees have formed an alliance to provide the medium for the mutual exchange of ideas on development and marketing.

Considerable market research, both at home and overseas, determined that the most popular and convenient size of refrigerator for the normal household is in the 3 cu.ft. class. This size has been adopted for the first Main model now being produced.

To investigate the problems and trends of refrigerator manufacture, a visit to the United States was made by a team of Main technicians. As a result, arrangements were made, for special tools, which were unobtainable in this country, to be imported. The appearance of the 'Main' cabinet, produced from these special tools, is enhanced by its pleasantly bowed top and shaped door.

Another distinctive feature is the grey breaker strip, and the absence of any visible screws, which facilitates cleaning. The door is secured by a positive catch, and closes at a touch. Immediately beneath the door is a removable plinth panel, giving access to the storage space in the base, the automatic flint lighter, and the gas control tap.

The evaporator is constructed to give a frozen-food storage compartment larger than usual for a domestic refrigerator of this size and of ample capacity for the needs of the average family. Masked by a white plastic cover with drop door, the evaporator will accommodate the two ice trays supplied, plus about 4 lb. of pre-packed frozen-foods or ice cream. Alternatively, it will take 6 lb. of frozen-foods or ice cream if the ice trays are removed.

Two full width shelves and one milk shelf, in fine chromium finish, are provided. Two clear, plastic interchangeable containers are provided. One, supported on runners below the frozen-food compartment, is for meat or fish; and the other is for salads.

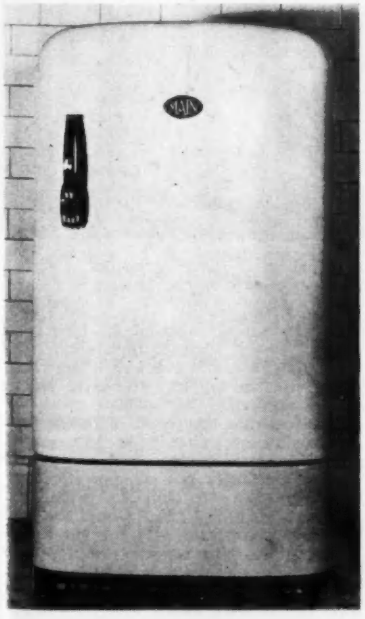
The burner of the 'Main 32' has been specially designed to obviate the troubles sometimes encountered in gas-operated refrigerators by the burner holes becoming choked. The circumference of the burner ring is greater than the circumference of the flue, the flames being directed by angled ports to converge into the bottom of the boiler. Thus any deposit which may fall from the flue will drop through the burner ring and not clog the burner holes.

The thermostat is fitted at the top of the unit immediately under the ventilation grille for ease of maintenance. The control, situated in the top breaker strip, gives a constant temperature in the cabinet. A special feature of the thermostat is that it can be exchanged, in situ, for thermostats operating for use with other fuels, should this be required. The gas supply is governed to eliminate any variations in mains pressure, and the gas control incorporates a defrost position.

The unit and cabinet are designed to make ice in room temperatures of up to 95°F., particular attention having been paid to eliminate heat leakages by direct conductivity.

The cabinet and accessories—except the plastic dishes—are guaranteed for *one year* and the sealed cooling unit for *ten years*—the first British refrigerator ever to carry this length of guarantee on its sealed unit, and proof of the confidence of the manufacturers in the efficiency of the appliance. The list price of the 'Main' 32 refrigerator is 54 guineas, plus purchase tax of £21 8s. 5d.

To mark the introduction of the appliance and to serve as an enduring aid to the housewife in making the best use of the refrigerator, the makers have issued a very attractive 48 pp. handbook containing instructions for use and an appetising selection of recipes, followed by hints on the appropriate temperatures for wines, long and short drinks, and long drinks with ice cream.



SPECIFICATION

CAPACITY
3.2 cu. ft. (gross).

SHELF AREA
6.3 sq. ft. including base of liner.

FROZEN FOOD STORAGE
Storage space for about 4 lb. of frozen food and 2 lb. of ice.

ICE TRAYS
Two aluminium trays with lever device for easy removal and flexible plastic dividers. 2 lb. of ice (32 cubes) per freezing.

CONTAINERS
Two interchangeable, covered, plastic dishes.

CONTROL OF TEMPERATURE
Thermostatically controlled, giving a constant temperature in the cabinet. Gas supply governed.

DEFROSTING
Gas control tap has a defrost position.

FLINT LIGHTER
A flint lighter, operated from the front of the cabinet, is provided for ease of ignition.

LEVELLING DEVICE
Four levelling screws are fitted to ensure correct alignment.

GUARANTEE
The cabinet and accessories (except plastic dishes) are guaranteed for one year and the sealed cooling unit for ten years.

GAS CONNECTION
¼ in. B.S.P. male or ¼ in. B.S.P. female.

EXTERNAL DIMENSIONS

Height	46½ in.
Width	24½ in.
Depth	24½ in.
Depth, including handle	26½ in
Depth, including door swing	45¼ in.

STREET HEATING BY GAS . . .

. . . originally a British idea

Recent items in newspapers and on television have focused attention on the possibilities of overhead radiant heating in the open air. Publicity has been given to the Schwank burner, manufactured by Schwank Gasgerate G.M.B.H., of Cologne, which has been

Gas-fired radiant heaters were one of the sights at the British Industries Fair at the White City in 1935. The statement 'This is Gas' appeared on the columns to counteract visitors' belief that the fuel used was electricity.

used in a number of installations, notably in Bremen. In particular, it has been claimed that heaters of this type are a means of combating smog. Herr

An example of a shopping arcade in which were fitted overhead radiant heaters. Like the other photographs on this page, this was taken before the war.

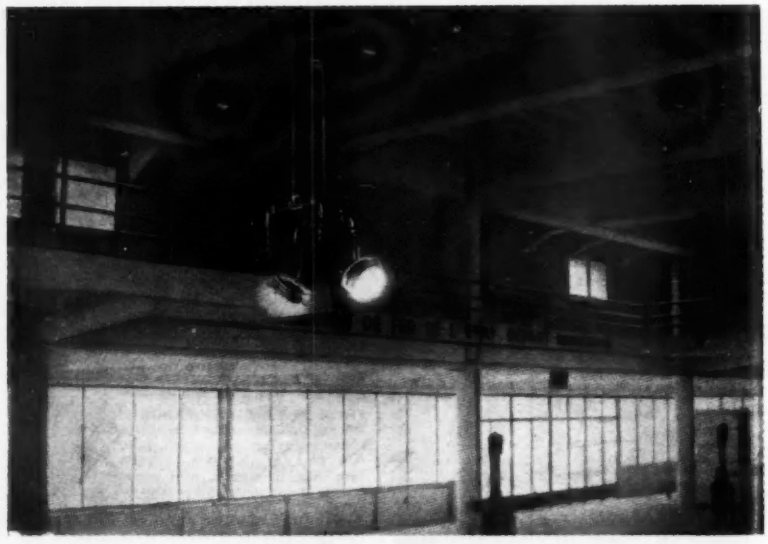
Gunther Schwank's arrival in this country on February 15, determined to warm our streets and make shop gazing a pleasure even in the coldest weather, resulted in a story 'This Man Wants to Warm Our Streets,' published in the *Daily Mirror*, as well as reports in other papers. The report quotes Mr. J. W. Pallister, Middlesbrough Divisional General Manager of the Northern Gas Board, as announcing the Board's decision to hang lamps outside the showrooms in Middlesbrough and Newcastle-upon-Tyne to show shop-owners how effective they can be. The cost of the heaters is stated to be about £50 for a shop, and the cost of heating about 9d. an hour. Throughout the implication is that using gas for this purpose is something new and of German origin.

However, it should be remembered that the use of radiant panel heaters for this purpose is by no means new; and far from being of German origin, it was first developed in this country. The first radiant heating installation (indoor) to be carried out was, to the best of our knowledge, at St. Saviour's Church, Islington, in 1929. The manufacturer responsible was Radiant Heating, Ltd., who has pioneered the flameless surface combustion heater, and this initial success was followed by a large number of installations in factories, churches, etc., including a Paris race-track in 1932 and the British Industries Fair at the White City in 1935. This last was a phenomenal success, and the Gas Light and Coke Company found it necessary to mark the columns supporting the heaters 'This is Gas,' as most visitors were under the impression that it was electricity. The heaters were 30 ft. from the ground, each heater burning 80 cu.ft. of gas per hour.

Many readers will probably remember the Mr. Therm constructed of porous refractory brick which was, for many years, over the facia board at the Colchester Gas Showrooms and operated effectively in all weathers without any replacements. The heat could be felt up to 30 ft. away. Surely this would make an excellent sign for all gas showrooms?

The success of this Mr. Therm indicated the possibilities of using radiant panel heaters in the open air. Later experiments showed that this form of heating was effective in football stadiums, race-tracks and shopping arcades. However, the development of other types of work by Radiant Heating, Ltd., and the failure of the gas industry to realise the possibilities of this valuable potential load, caused the matter to be shelved. As the Company has been hard put to it to meet the demand for heaters for factory, restaurant and church heating, no further work has been done to expand the possibilities of using the heaters in the open air.

In view of the widespread national publicity given to open air heating, this might be an opportune moment for the gas industry to take the matter up again. Even with gas at its present price, the heating of shop fronts and arcades by these appliances, is an economic possibility, and the effect on business at dog-tracks, etc., might well make their installation a sound investment. Using the fan air system, neither high winds, rain nor snow would have any effect whatever on efficiency, no protective shields being required.



A slightly different type of installation was this at a Paris race-track. Violent draughts, etc., in no way affected the efficiency of the heaters.

We feel that the scope of this type of heating business should be fully investigated. Here is one service in which neither electricity nor oil can effectively compete. We are able to reveal that Radiant Heating, Ltd., would be prepared to co-operate with the gas boards in promoting this service. In our view the boards should not ignore this chance of securing an entirely new and probably substantial load.

COAL FOR THE GAS INDUSTRY

A SUMMARY OF A PAPER TO THE LONDON AND SOUTHERN SECTION OF THE INSTITUTION OF GAS ENGINEERS, ON FEBRUARY 16, BY

E. M. MYERS,

F.R.I.C., M.I.Chem.E., F.Inst.F., Divisional Coal Preparation Engineer, Durham Division, National Coal Board.

In recent years mining methods have undergone radical changes in efforts to reduce the cost of production. Labour charges constitute 60% to 65% of the cost of coal production and, therefore, the aim has been to introduce and increase mechanical means of coal getting. In the days of hand hewing and filling it was possible to 'pin point' the source, in the pit, of tubs of coal containing excessive amounts of impurities, and steps could be, and were, taken to deal with such conditions. There was thus an incentive to the miner to get and fill clean coal. With the advent of mechanical conveying, this incentive has practically disappeared.

Since the introduction and extension of mechanical getting and loading there has been a marked increase in the quantity of impurities sent to the surface, because such machines cannot discriminate between coal and dirt. The quantity of impurities varies. It depends mainly on their natural occurrence in or adjacent to the coal seam or seams.

The most practical and economic methods of separating coal substance from mineral substance are by making use of the difference in specific gravity of the two, although other methods have been used—*e.g.*, spiral separators and other cleaners which depended on the difference in the coefficient of friction. In recent times, however, other systems have been devised which utilise the difference in other properties of coal and its associated impurities (*e.g.*, froth flotation, which depends on the preferential adsorption of oil on to the surface of coal particles so that they become hydrophobic while shale particles are unaffected and easily wetted by water. The particles are effectively separated by air in the form of fine bubbles which attach themselves to the oiled coal particles and cause them to rise to the surface in the form of a froth).

Water and Air Separation

The two main media which have been used for separating impurities from coal have been water and air. It will be noted that the former must produce a damp or wet cleaned product, while the latter will turn out a product containing a moisture content similar to that which the coal contained when it was mined.

However, the use of air as a separating medium has several disadvantages, among which are:—

(a) Due to the density of air being much lower than that of water, the lowest effective separating gravity at which cleaning can be effected is 1.75 to 1.85.

(b) Particles below ¼ in. are indifferently separated, while below $\frac{1}{16}$ in. no separation of mineral matter takes place.

(c) In spite of all precautions there is a difficult dust problem. Further, in all air-separating plants (or dry cleaners, as they are commonly known) it is noticed that the discard or separated mineral matter rarely contains its proportionate volume of 'fines,' as these pass into the cleaned product.

(d) The great drawback of this air separation method is that it is essential that the raw coal to be treated should be reasonably dry; otherwise efficiency is greatly impaired. Under present mining conditions dust suppression methods necessitate the use of water infusion or water spraying at the face. This, in turn, produces damp or wet coal. This is the main reason why there has been a progressive reduction in the tonnage of coal cleaned by this method.

(e) Air separation cannot be used for particles greater than 2 in., so that other methods have to be adopted for this larger coal.

Among the advantages of using air are:—

(a) The coal is kept at the same moisture content as that at which it reaches the surface.

(b) The inerts in the dry cleaned coal are, therefore—

(i) Pit moisture.

(ii) Impurities made up of inherent mineral matter content and adventitious mineral matter not extracted in the air separation.

Air separation developed greatly between the wars, especially in Durham and Northumberland, where the raw coal was such that the 'fines' fraction was not very dirty and did not constitute any difficulty in the final product, which had an ash content varying between 6% and 8%.

Wet Washing

The second medium—water—has been used for coal cleaning for well over 100 years, and was adapted for this purpose from the metalliferous industry which has used it from time immemorial for upgrading ores. The hand panning of gold bearing ores to produce gold, and diamond bearing matrix to produce diamonds, is nearly as old as history.

The advantages of wet washing, using modern methods are:—

(a) Complete control of the separation process for particles down to 0.02 in.

(b) Particles below 0.02 in. can be separated by froth flotation.

(c) Separation can be effected in Baum type jigs or troughs (Rheolaveur) as low as 1.5 SP. GR. on nut sizes and 1.6/1.8 SP. GR. on particles below ½ in.

The disadvantages of wet washing are:—

(a) Products contain more water than they did in the raw state unless dried by thermal means, which is expensive.

(b) Unless froth flotation is used (which is costly), a slurry problem arises.

(c) Wet washeries cost more in capital and have higher operating charges than air separators.

The Gas Council was informed some years ago that there would be a gradual change from cleaning by air separation to wet washing. In consequence large-scale tests were carried out to determine the behaviour of washed coal when handled and carbonised in the normal manner with existing equipment in large gasworks. These large scale tests proved that there was no handling difficulty and little change in the carbonisation results, although the tests were made on coal no larger than 3 in. The plant at which these coals were washed was not of modern design and the fines were not froth floated (whereby their 'stickiness' would be removed), nor were they intimately mixed with the 'smalls' by paddle mixing, as is the case in modern plants. It is certain that no difficulties will be experienced when all precautions are taken, because the practice greatly assists 'handleability.'

Use of Dense Medium

During the last decade a third medium has been used for the preparation of coal. This is known as a dense medium and may consist of (a) a suspension of magnetite in water, (b) a suspension of barytes ($BaSO_4$) and clay in water, and (c) a suspension consisting of specially prepared slimes tailings either resulting from the froth flotation of coal or prepared by grinding a suitable shale. It must also be mentioned that if a suspension of sand in water is regarded as a dense medium, then the Chance process, which makes use of sand, has been in existence for over 30 years.

The disadvantage of dense medium separation is that up to the present time it has not been possible to separate particles below $\frac{1}{16}$ in. and very often the 'cut' is made

at $\frac{3}{4}$ in. or even $\frac{1}{2}$ in. As a result, under the most favourable screening conditions the froth flotation process must be used for the fraction below $\frac{1}{16}$ in. Such a combination of systems is being successfully applied at two washeries recently installed at Mansfield and Nantgarw collieries.

It must be emphasised that there is no single known process which can be universally applied, or used, for cleaning and preparing run-of-mine coal. The coal producer is faced with choosing those processes which best comply with the following requirements:—

(a) Low capital cost.

(b) Low operating and maintenance cost.

(c) High efficiency or separation consistent with high-value products and a discard containing a low proportion of coal.

Treatment of Middlings

It will be realised that, if run-of-mine coal was just a simple mixture of coal particles and mineral matter particles, separation by specific gravity methods would be comparatively simple. Unfortunately, the raw coal contains material which borders on both coal in the low gravity ranges and mineral matter in the higher gravity ranges; and these 'middlings' normally require special treatment.

Normally, the discard from the cleaning of high rank gas or coking coal has an ash content of 70%-80%, the remaining 30%-20% is volatile or combustible matter present as carbonaceous shales, water of crystallisation, carbon dioxide from the decomposition of carbonates, and sulphur dioxide from the combustion of pyrites. It follows that the most efficient cleaning processes, or combination of procesess, to be used on a given run-of-mine coal is that which produces the highest calorific value in the clean products and the lowest calorific value in the discard, always providing that the clean products are of such a quality that they meet the consumers' reasonable requirements.

In the County of Durham the distribution of preparation processes dealing with a 'Raised and weighed' output of about 30 mill. tons per annum (this is equivalent to about 27 mill. tons saleable), is as follows:—

	Saleable Mill. tons per annum.
(1) Air separators (dry)	5.49
(2) Dense medium	0.57
(3) Other wet washeries	8.29
(4) Froth flotation	0.26
(5) Hand cleaning	6.16

This is planned to be supplemented during the next five years by the completion of new washeries with a nominal input capacity of 4,000 to 5,000 tons per hour, or approximately 10 to 15 mill. tons per annum. Most of these new and reconstructed plants will be so designed that they will be able to produce various sizes of coal (large, graded, or smalls) or to blend all or any of these sizes to prepare mixtures as desired.

Cost of Cleaning Plant

The cost of a modern cleaning plant complete with raw coal handling equipment and sidings, is of the order of £1,500 to £2,000 per ton-hour, while froth flotation plants by themselves as an adjunct to existing washeries cost £3,000 to £5,000 per ton-hour.

Operating costs, including depreciation and interest charges, can vary between 1s. and 3s. 6d. per ton of cleaned product depending on the following factors:—

(a) Percentage of discard.

(b) Ease of cleaning.

(c) Process or combination of processes used—*e.g.*, froth flotation is an expensive operation.

(d) Whether plant is old or new (this affects the interest and depreciation charges).

(e) Whether washing is carried out on single or double shifts.

It is important to note that the greatest cost effect on the economic price of clean coal results not from the operating cost, but from the loss of vend due to the amount of discard which has to be thrown away.

As has already been stated, labour represents 60% to 65% of the total cost of producing coal at the pithead It should be mentioned that it costs just as much to produce 'discard' at the pit head as it does to produce clean coal. Therefore, if after passing through a cleaning plant the product represents only 80% of the amount that entered the plant, then the additional cost to the coal producer is considerable and might easily represent 10s per ton.

For carbonisation purposes it is desirable to have a low and regular moisture in the prepared coal. In the clean product from a washery this can only be accomplished mechanically or thermally. For this purpose centrifuges are now being commonly installed for dewatering coal below $\frac{1}{2}$ in. and above $\frac{1}{16}$ in. For the minus $\frac{1}{16}$ in. the proved method is by thermal drying, although the new 'Convertrol' process is being examined as an alternative.

It must be stressed that all these additional processes, such as centrifuging and thermal drying, although they provide a more consistent and higher calorific value fuel, do not increase the total calories which the coal producer has for sale; in fact, they may even reduce them slightly. Consequently, such additional processes can only be used at an additional cost to the producer and a consequent increase in price to the consumer.

DISCUSSION

Mr. J. C. Hogg (Bournemouth) said quality diversity was the gas engineer's main bugbear. With the types of coal the industry had had to handle during and since the war, a feeling had developed that all coal was bad, and that quality control had been allowed to lapse and become a matter of secondary importance. That feeling was to a large extent due to a lack of appreciation of the type of control which they in the gas industry exerted over their own products. They had to control their gas within narrow limits, and they had, from a business angle, to control their coke performance in order to sell coke to consumers, and it was puzzling to the engineer to find that the results of his analysis, determined with accuracy and care and in accordance with standards, were dissipated in various channels and did not get back to the colliery in the form of complaints. He was sure that Mr. Myers would appreciate the importance of the cost of handling even 1-2% of additional ash encountered in a bad consignment of coal. The additional cost of handling the ash was inevitably reflected in the cost per therm of gas. The gas engineer based his output on therms per hour, and the additional inerts could very materially affect the therms per hour from a given retort house.

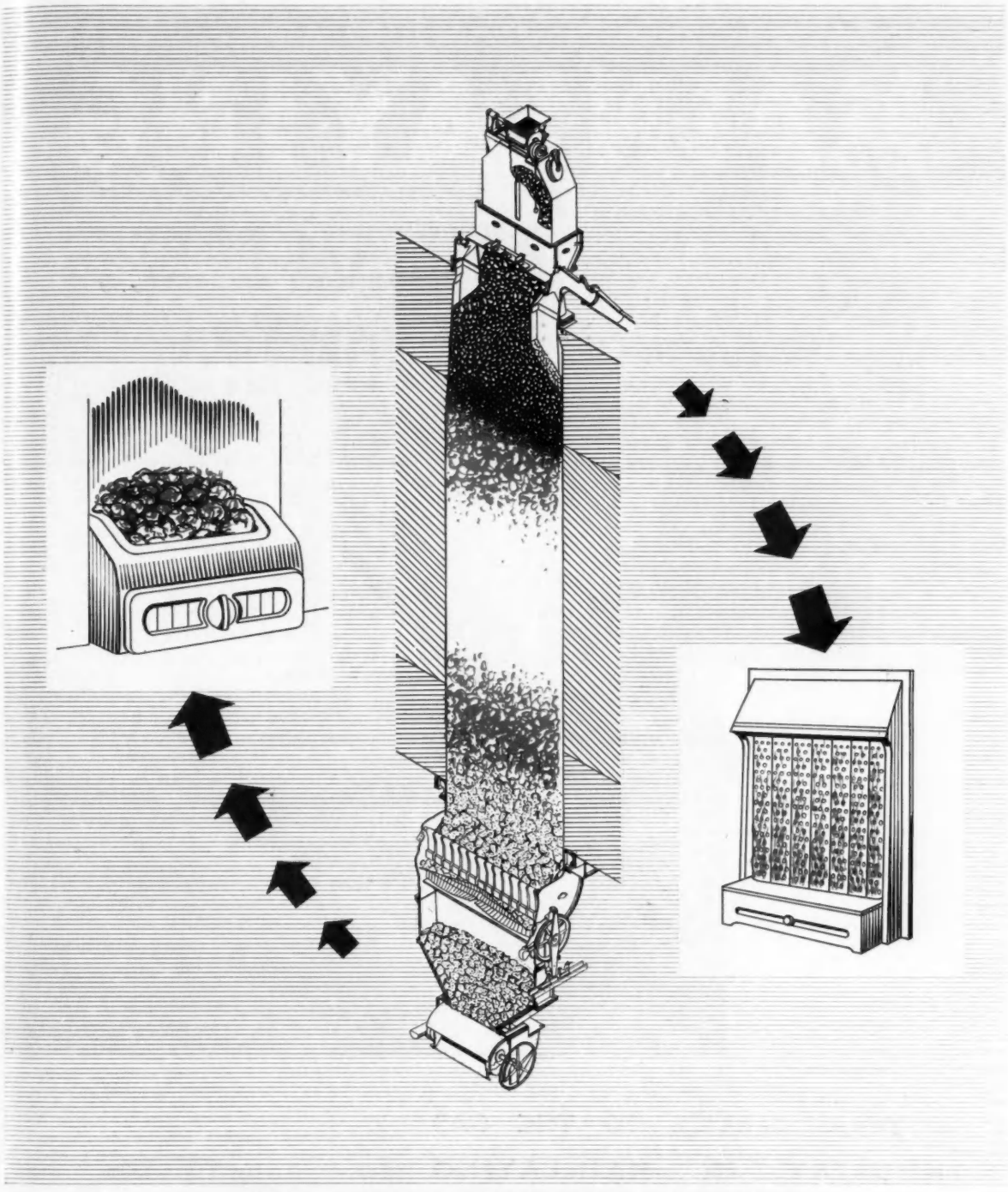
Cleaning of Fines

Reference had been made to the difficulty of the cleaning of fines. They, at the receiving end, apart from the ash content of the fines, encountered the dust problem associated with those fines. If the ash was allowed to remain in the larger sizes they met with shale problems which indirectly affected coke sales, and he wished they could hear more about plants to overcome such disadvantages.

Mr. A. Bean (National Coal Board) recalled that the coal industry was nationalised because it was dealing with a product that was a national possession. But the National Coal Board had been left with seams that were dirty and narrower, following a period in which they had not been allowed to spend money on improvement schemes. A large measure of mechanisation had been introduced, resulting in the production of dirtier coal. They had to make up the time lag accumulated during the war, and they had to supply coal which in the past would have given the consumer cause to shudder. They were the facts, and they would be failing in their duty if they did not face them.

He had been asked to say something about the price structure. Whatever they thought about the price structure, at least it gave them a yardstick by which to measure values. It might not be a very good one, but it was a yardstick, and it was consistent from one day to another. It was not used to value anything other than coal characteristics. For the first time coal was priced according to its characteristics, and he commended the price structure to their consideration.

Mr. G. Dougill (North Thames) expressed surprise that mechanisation was not proceeding so rapidly as people were commonly led to believe. It was being applied, apparently almost against the best interests of the mining industry, to



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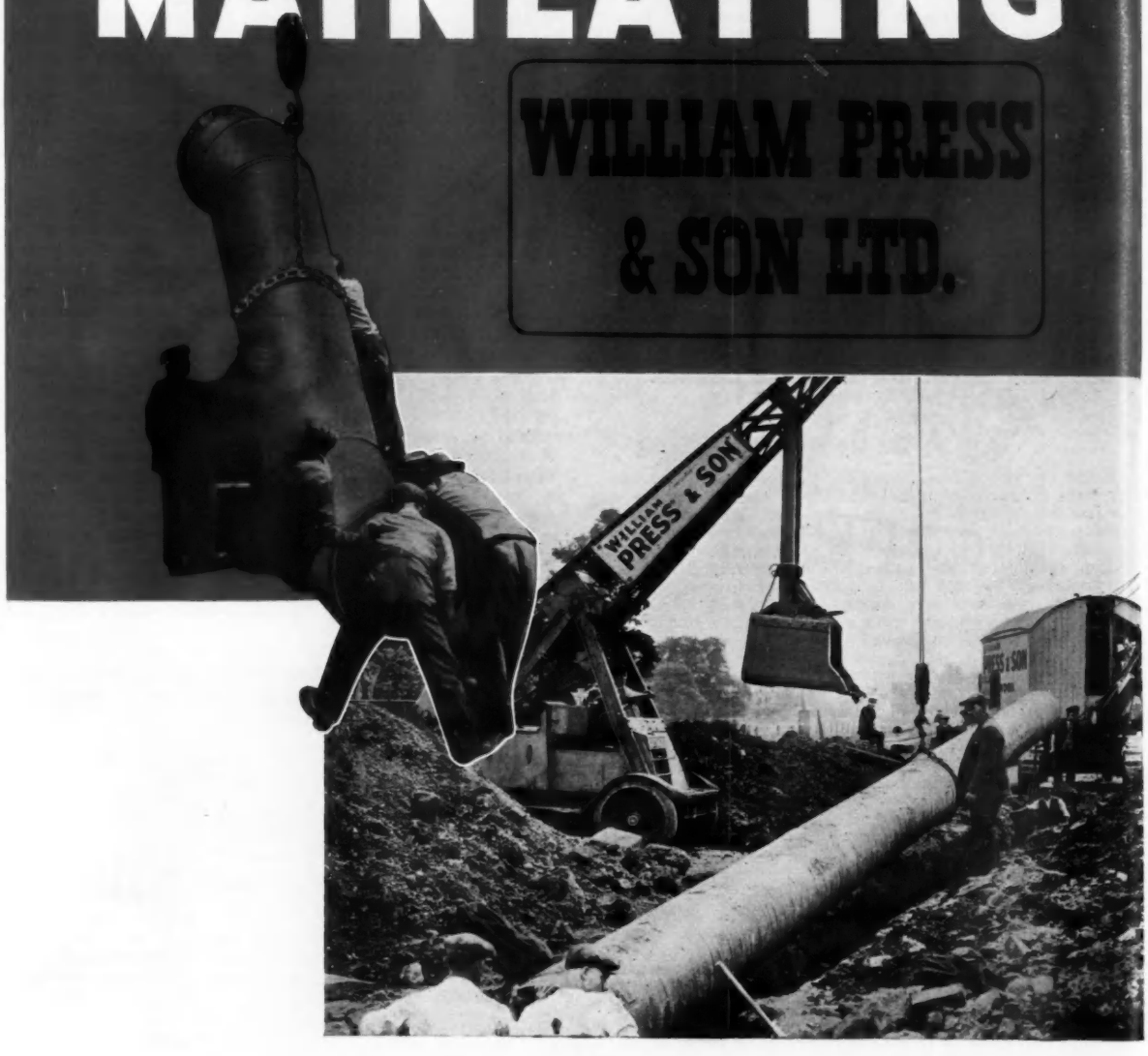

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reduce the cost of coal and to increase the quantity obtainable. Yet in spite of mechanisation the output per manshift was growing only slightly, the cost was not being reduced, and the quantity was not increasing. On the question of the cost of cleaning coal, he wondered whether the cost was assessed on the sale price of dry coal or whether it was based on the original coal with its ash content.

Disincentives

Mr. H. M. Lawrence (Portsmouth) said that with the development of mechanisation there appeared to be no incentive in modern mining to produce clean coal; he wondered what disincentive there was in the way of producing dirty coal. It might be possible to effect a substantial saving in capital costs if something could be done to encourage miners to produce coal as clean as possible. He noticed that Mr. Myers had made no reference to opencast coal, which represented some 5-6% of total production. He (Mr. Lawrence) was concerned with opencast coal in its early days, and it was difficult at that time to produce clean coal, but with improvements in plant there was no reason why the percentage of ash in opencast coal should not have improved in the last 10 years.

Mr. N. Gotheridge (Royal Arsenal, Woolwich) spoke of a very wide range of coal quality from Northumberland, and said that when he took the matter up with the National Coal Board he learnt that as many as six different seams were being worked at a single colliery. Due to the blending of the different qualities of coal they encountered a lot of clinker troubles and they got a very heavy coke density.

Mr. E. O. Rose (Tottenham) said it seemed obvious that mixing was taking place in Durham more now than before the war. He wondered whether it was being done to ensure better quality or had it anything to do with transport and other difficulties? Mr. Myers had spoken about the cleaning of coal under $\frac{1}{8}$ in., but it did not appear to him that that affected gas engineers directly because they did not buy it, as such. Was it going to the power stations, or for special processing, or for briquetting?

A Long Term Problem

Mr. L. J. Clark (North Thames) said Mr. Myers had stated that the cost of coal cleaning might be between 3s. and 4s. per ton, but he wondered if anybody had worked out how much a ton of shale supplied to the gas industry actually cost in transport. It was conveyed to the gasworks, to the retort house, through the coke grading plant, distributed in small loads to the consumer, collected as ash and removed to the rubbish destructors, and finally to the tip or brick works. He would suggest that these costs amounted to at least £3 per ton and, in addition, inconvenience caused to everyone along the line of its passage. Mr. Myers had also stated that the loss of vend in coal cleaning, and particularly the combustible matter in the discard, might easily represent a cost of 10s. per ton. If, however, the ash was left in the coal, when it was finally combusted as coke, over 1% of ash was likely to carry with it about the same amount of combustible material and the overall thermal loss would be about the same, but the expense associated with it had been transferred from the Coal Board to the consumer.

The author had referred to the residual moisture content of coal after washing. This created difficulties in handling the coal on normal gasworks plants but, more important than that, due to lack of consistency in its moisture content it upset the carbonising plant very considerably. The process of carbonisation was dependent essentially on maintenance of consistent conditions. If the Coal Board could arrange for consistent supplies of either damp or dry coal to be sent to particular gasworks, their carbonising results would be improved. While on the subject of wet coal he would like to ask Mr. Myers for further information on the application and cost of centrifuges for drying coal and also for the thermal drying processes which he understood the Coal Board had adopted at some of its plants. He hoped Mr. Myers would visit the Section again in a year or two's time to tell them how most of the outstanding problems of dirty coal had been solved.

Mr. Myers Replies

Mr. Myers, replying to points raised in the discussion, said he wanted them to realise that his colleagues in the National Coal Board appreciated their troubles and difficulties, and no-one would be more pleased than himself if it was possible to supply them with a product which never gave rise to complaint and which saturated the offices of the National Coal Board with letters of praise. He could not at present, however, visualise letters of praise coming either from the gas industry or from anybody else. Every possible step was being taken to try to solve the problem of coal preparation.

Coal occurred in nature in very different ways; for instance, the average pit moisture in Durham was as low as 1½-2%, and in Northumberland it could be as high as 7-8-9%. The only water added by the National Coal Board was that used for cleaning the coal, and the pit moisture had no influence on coal cleaning. A mining engineer might conceivably control a colliery in which there were up to eight different seams, one under the other. To put in a separate cleaning plant for each seam would be both uneconomical and impracticable, and therefore, according to their present knowledge, they tried to get the coal out of the pit from the different seams more or less blended. It must be remembered that the chief object down below was to get the coal up to the surface regardless of where it came from. If it were possible for the Coal Board to put in separate plants for the different coals he was sure it would be done.

Answering Mr. Lawrence, Mr. Myers said he had not had much experience of opencast coal, although he had seen plenty of it. He was sure Mr. Lawrence was right in his view that where daylight was constantly shining on the opencast working it was easier to discriminate between the coal and its impurities. He believed, however, that opencast coal was only transient and would only occur for a few years, after which we should have to depend entirely on deep mine coal.

It had to be borne in mind that the volume of minus $\frac{1}{8}$ in. coal in run of mine was often as high as 20%, and it was impossible to segregate it from the larger coal and send it to a particular industry. It must go into the mixture of gas and/or coking coal. That was where it went, and that was why the National Coal Board was so interested in, and committed to, finding the best possible means of cleaning the fine coal and drying it. Mr. Rose had reminded them that there was more mixing now than before the war, and had asked who received the minus $\frac{1}{8}$ in. fraction. The answer was that it went as grist to the run of mine coal which formed the basic supply to their gasworks, and it was that fraction that they were so anxious to make low in moisture. If they were able always to have the same type of coal and to feed their cleaning plants at the same hourly rate and size they would be able to supply the gas industry with the uniform coal which it desired, and which it ought to have.

Importance of Consistency

He agreed with Mr. Clark that the cost of handling ash could be as high as £3 a ton. There were collieries in this country which were discarding up to 40% of the stuff coming up from below, and that 40% contained quite a lot of B.Th.U. which in time burned or made a nuisance of itself. There were people who thought the country should not be losing all that potential heat, but the remedy had yet to be found. He agreed that consistency was the most important property a coal should have.

Mention had been made of thermal drying. That was a very costly business, and he agreed that it was cheaper to dry coal outside the retort than inside. Some day he believed the National Coal Board would devise some means of doing the job rationally, practically, and cheaply. The Coal Board was, in fact, putting in a thermal drying plant for drying froth flotation fines. It had to be remembered that they were dealing with a natural product, and they were dealing with it by the best known means. It would cost between 15s. and 17s. per ton to remove all the water by thermal drying. He believed that some day thermal drying would be a *sine qua non* of the coal industry. It would certainly be easier to achieve it through the Coal Board than by private enterprise.

Dr. J. Burns, Chairman of the Section, said the gas industry appreciated that it had to pay more for clean coal, and from that point of view it might be agreed that the price structure was fair. He thought that, within reason, the industry was quite prepared to pay more for a better product. To date the Coal Board had spent something like £9.5 mill. on washers. Compared with the average annual income of £600 mill. (at £3 per ton on 200 mill. tons of coal) that did not seem a very large figure. We appeared to be beginning to see some of the effects of the Coal Board's operation on the cleaning of coal. He could say that for the first time since the war the total inerts in the coal supplied to the North Thames Gas Board were lower in 1953 then they were in 1938. True, the decrease was small, but it was a move in the right direction.

A vote of thanks was proposed by **Mr. J. M. E. Webber,** seconded by **Dr. H. Hollings.**

A net increase of 232 members during the past year was reported by the retiring President (Mr. G. N. Swayne) at the inaugural meeting for 1954 of the Society of Engineers, which is entering its centenary year. Mr. Swayne handed over the Society's 50-year-old gold and enamel Presidential badge to Mr. Walter R. Howard, a Vice-President and Hon. Treasurer, who has been a member of the Society since 1917 and is also a member of the Institution of Structural Engineers and British Hon. Secretary of the Société des Ingénieurs Civils de France.

ACCOUNTING AT GROUP LEVEL

FROM A PAPER TO THE YORKSHIRE JUNIOR GAS ASSOCIATION, ON FEBRUARY 6, 1954, BY

K. L. PICKTHALL,

Group Accountant, Huddersfield-Halifax Group, North Eastern Gas Board.

In the North Eastern Gas Board, the group general manager has full responsibility for the operation and control of his particular group, and his officials are responsible to him for the running of their own departments. Only in the case of the group accountant is there the further direct responsibility to the chief accountant for financial co-ordination. In the Huddersfield-Halifax Group the group accountant is responsible for the preparation of all the financial and statistical records of the group, thus ensuring that the Board's revenue and expenditure is fully protected and controlled in accordance with the policies defined from time to time by the Board, and for the submission of management statements as are required by the general manager or any other operating official.

The main responsibilities in the group accountant's department have been segregated under the three main divisions, with senior accounting assistants controlling the day-to-day expenditure and revenue functions, and an accountancy assistant, primarily concerned with the aggregation of all the final accounting figures, budget estimates, periodic variation statements, and management statements generally. All three are very important accounting personnel, directly responsible to the group accountant, who co-ordinates their respective activities. The line of control is clear, but in relation to the districts, the line of control is through the district engineer and manager to the chief or head clerk.

Income Sections

The various income functions are so inter-related that it was considered advisable, certainly in the early stages of our development, to co-ordinate the work under one section head, apart from the group cashier, who must ensure that all cash received is properly accounted for and promptly banked. He has other duties concerned with expenditure, which are the recording and payment of petty cash items and the responsibility for the actual payment of cash, salaries and wages.

The section head must ensure that all revenue arising from gas sales, residuals sales, and sundry charges is properly accounted for, and in particular that meters are read and collected according to programme; that accounts are correctly calculated and promptly charged; that the analysis of the income is in accordance with financial and statistical requirements; that cash is posted daily to the individual accounts and agreed with the cashier's bankings; that accounts in arrear are followed up on a systematic basis; that balances on control accounts are in agreement with the total of the individual accounts in the rentals; that records are maintained for unread gas calculations; and that the detail work involved in the introduction and extension of the machine billing is done according to programme.

To cover these duties he has the assistance of a number of sub-section heads who are responsible for specific jobs relating to meter reading and prepayment meter collection, ordinary gas rental, and so forth. At present we are in the midst of a change-over to machine billing, and while the duties of the section vary somewhat on this account, the final responsibility is the same—to produce a statement showing the amount of revenue due to the Board analysed into therms and/or cash revenue for gas, meter rental, appliance rental, hire purchase instalments charged, and the amount credited by way of cash, discount and allowances.

Until further development takes place, the machine room has been placed under the supervision of the section head—debtors control—as the main mechanisation to date is concerned with the billing of gas accounts. In addition to three billing machines, there are two comptometers and listing machines, and addressing equipment consisting of an embossing machine and a printer with address plates for all the credit consumers in the group.

For districts not yet being billed on machines, this section generally summarises the rentals and extracts the analysis. Further development of machine accounting is under consideration. Apart from the financial saving on labour which generally follows the introduction of machine methods, there are other advantages not measured in terms of money, such as the elimination of the drudgery of certain routine work, the speed at which information can be made available, the additional information produced for the same effort, the reduction in errors arising from the human element, and the neatness of the work produced.

Expenditure Sections

The expenditure sections are dealt with in a similar manner as for income. The section head must ensure that all invoices received for the group are dealt with promptly and are certified as to the receipt of the goods and/or service rendered, correctness of the prices charged, the accuracy of the calculations, totals and discount. He must check the coding given to the expenditure, but most important of all, he must see that official orders have been issued to cover the expenditure, or that the item is covered by the authorised list of standing charges.

The section head is responsible for ordering procedure, the control of materials after purchase, and the recording of its use. To the storekeeper is delegated the task of the physical control. Goods received must be checked against advice notes and copy orders, and recorded. Issues must be made only against requisitions submitted by authorised signatories.

The responsibilities of the wages and salaries section are obvious enough. The section must ensure that wages and salaries are computed for each employee in accordance with the rates of pay agreed with the negotiating bodies, and that the time worked is verified; that deductions are correctly made in respect of national insurance, P.A.Y.E., pension schemes and other miscellaneous items; that insurance cards are stamped up-to-date and appropriately surrendered to the authorities, and that P.A.Y.E. and other deductions are handed over to the proper persons; and that wages are correctly allocated to the appropriate expenditure codes and summaries prepared for the financial periods.

Costs and statistics are so inter-related that it was decided from an organisation point of view that the two functions should come under the control of the same section head.

Board Statistics

Board requirements incorporate the information required nationally, but, in addition, the Board introduced a monthly district return, a comprehensive statement from each district, being the statistical presentation of the production efficiency, distribution work carried out, and the sales effort for the month. These figures, together with the national statistics items on production and manpower, are summarised as quickly as possible. Calculations of thermal yields, etc., are made, and submitted to the group general manager.

The gas yield per ton of coal carbonised means nothing much by itself, but when taken in relation to the gas output, the residual yields and the F.E.I., one is in a position to assess the thermal efficiency of the working of the plant. A statistics summary provides such information at sight,

and furthermore shows the results against the budget standards.

The internal audit is under the control of the chief accountant. Each group has two internal audit assistants, and their function is to advise the group accountant and the group general manager of the manner in which the various accounting systems are operating. Any shortcomings are reported and if necessary the group accountant takes such action as is required. The Board relies on the internal audit to ensure that Board policy is being implemented, and that systems in force are adequate for this purpose and fully protect the Board's interests.

The group accountant has a job of responsibility, ensuring that the work is being carried out as efficiently as possible, and in accordance with Board policy. Regular meetings of group accountants are held, presided over by the chief accountant, when all matters of policy and accounting generally are discussed. Decisions arising from these meetings are conveyed by the group accountant to the staff either through the medium of meetings with the chief clerks and section heads or to the district engineers and managers at monthly meetings.

Gas Supply in a Rural District

Discussion on Mr. E. J. Hoadley's Paper—see February 17, pp. 421-4.

The President, **Mr. W. Johnson,** opened the discussion by relating how, whenever he visited Kent County and saw the resident fitters, he was impressed by their dignity and reliability. These men were, in that sense, superior to their equivalents in the London divisions, for they had to accept greater responsibility. He had one criticism to make of the author's suggestion on the payment of bonus. He did not think such a scheme would work if it were an absolutely fair one. It was generally accepted in industry today that the money should go to the man who actually got the order, although his efforts were backed up by a team of willing workers. Joint consultation was a grand thing provided that the people on the staff side responsible for representing the management had a real belief in its value. They were dealing with men not so well educated as themselves, and much of the material brought forward was trivial. But among those trivialities was often something worth hanging on to. Mr. Johnson often had the feeling that too often consultation was confined to the manual worker, and the staff worker did not receive the same consideration.

Care of Display Material

Mr. A. Bell (Rochester) said that in the provinces one had to be capable of jumping rapidly from one subject to another. Also, one must be able to provide the answer without reference to a specialist next door. On the subject of authorised dealers, Mr. Bell asked how the author ensured that display appliances or material on the premises were kept clean. It was not uncommon to find a gas cooker or other appliance covered in dust amid a collection of baths, tiled surrounds, etc. To get full value out of dealer schemes appliances must be kept in first-class condition and price cards had to be frequently renewed. Mr. Bell was glad the author had stressed the underlying principle of bonus and commission; that they should only be paid for increased sales. He did not share the President's view that only a bad scheme would be successful. He confessed he was puzzled to know how one fitter coped with 2,000 consumers, particularly as they were spread across nine villages, and one could only assume those villages were very concentrated. Could the author tell him what was the average gas consumption of those 2,000? Mr. Bell also asked for a definition of an 'emergency' such as would merit the calling out of a stand-by fitter. One could readily appreciate the impossibility of maintaining showrooms in every country village. Had the author considered the use of a showcase large enough to take one appliance with suitable posters and showcards?

Mr. C. Pearson (North Thames) levelled a criticism at gas stands at agricultural shows. They were not always worth the cost because electricity could sometimes show gas up; they had so many more gadgets for agriculture. Joint consultative committees were too inclined to stress the welfare aspect; Mr. Pearson felt more stress should be laid on efficiency. If only fitters could collect the money on the spot when they called on consumers to supply, say, loose parts for a cooker, a lot of money would be saved the consumer. Some fitters did not like the idea of handling money, but they would have to learn to like it sooner or later or they would price themselves out of a job.

Mr. J. V. Rigg (Watson House), referring to the author's remarks on 'putting the employee in the picture,' was pleased to note that he had mentioned the field commander under whom Mr. Rigg also had served. Lord Montgomery had adopted a policy of conveying the strength of his convictions in the form of a news-sheet to his troops. The only criticism Mr. Rigg had to make of the North Thames news-sheet was that it could perhaps be a little more ambitious in its declarations on Board policy. That would go a long way towards putting the employee 'in the picture.'

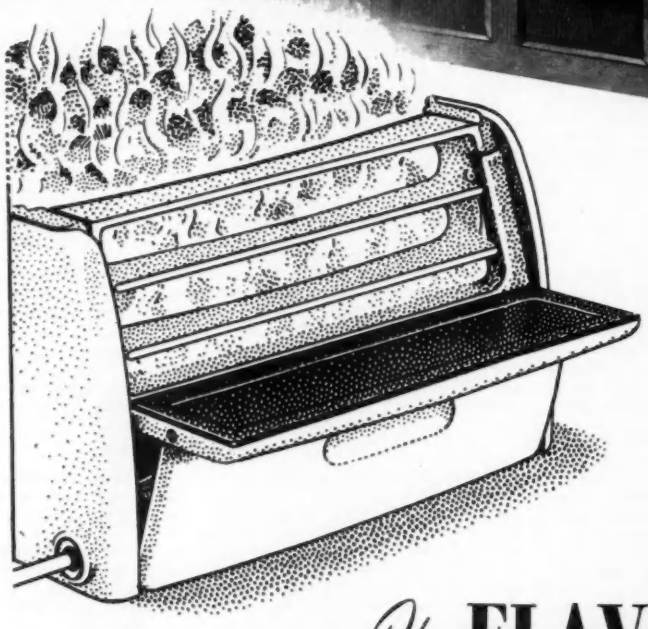
Mrs. Eileen Murphy (Gas Council) commented that the author referred to 'our home service adviser.' Even considering her own modest recommendation to the Gas Council, she thought it would be advisable to have three advisers for 32,000 consumers. Home service advisers were more important in such an area as the author's because in a town the domestic load was not so large proportionately. Mrs. Murphy said she was often annoyed because it was only considered suitable for women lecturers to address women's organisations. From what she knew of men's organisations many of them would like to have a home service adviser to talk to them.

Mr. J. D. C. Woodall (Divisional Sales and Service Manager, and formerly Group Manager, Maidstone Group) said that the place of the old engineer and manager in the scheme of things was now being taken by the district manager and the industry in the future was going to depend on how district managers did their job. He hoped some of the area boards would consider sending some of their trainees to the provinces for training, and that his own Board would send some of their trainees to his Group, where he thought they would be taught a lot. If he might answer Mr. Pearson's remarks concerning gas stands at agricultural shows, he would say that the object of appearing at these shows was not just to show appliances to farmers, but chiefly to show the farmer's wife what she could get out of gas.

Mr. A. E. Livett (Vincent Street) asked if the author had considered the fitting of a van with spare parts and whether it would be an attraction in a country district for a fitter to be able to replace a part from his van's stock.

Average Annual Consumption

Mr. E. J. Hoadley replied to some of the points raised in the discussion. Commenting on the President's remarks concerning resident fitters, he said that they were specially selected for their job, and were usually able to stand on their own feet. Mr. Bell had asked about authorised dealers keeping appliances clean. In the agreement that was signed it was incumbent upon the dealer to look after the appliances himself. Replying to Mr. Bell's assertion that consumers might suffer in consequence of a fitter having to cope with 2,000 consumers, Mr. Hoadley said the average consumption was 135 therms per consumer, which was rather better than the usual average. What was an emergency? Mr. Hoadley said he would define it as 'no gas' or an escape in circumstances which were likely to cause hardship. Mr. Hoadley said he liked the suggestion about showcases, but they had to be perfectly air-tight or the exhibits and literature might tend to look part-worn after a time. Mr. Bell had also asked how it was possible to interview trainees individually. The only way he could complete the programme he set himself was by starting his day at 8 a.m. While acknowledging Mr. Pearson's contribution to the discussion, Mr. Hoadley mentioned that he read in 'GAS SERVICE' recently that the electricity industry thought our public relations first class. (*Taurus* wrote in February 'GAS SERVICE': '. . . we should tell you that we think that the gas industry is exceedingly well organised, their salesmanship is good and their public relations organisation superb.') Mr. Hoadley said he thought it would be unwise of him to comment on Mr. Pearson's suggestion concerning the collection of payment by fitters, as the matter would be of interest to the trade unions. He liked the idea of a van fitted with spare parts, but could not help thinking that the fitter might never have the right replacement on board.



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PRE-STRESSED CONCRETE HOLDER TANK

FROM A PAPER TO THE EASTERN SECTION OF THE INSTITUTION OF GAS ENGINEERS ON FEBRUARY 18, 1954, BY

F. WILLIAMS,

M.Inst.Gas E., M.Inst.F., Divisional Engineer, Norwich Division, Eastern Gas Board.

In the Norwich Division, as with all divisions of the Eastern Gas Board, the shortage of steel in 1951-52 mainly resulted in the postponement of projects for new gasholders, because they required greater tonnages than other items of gasworks plant. It became essential to investigate alternative means of construction which might result in a saving of steel. The alternative appeared to be the building of the tank in concrete. Though the use of a normal reinforced concrete tank would probably have saved some steel, the amount would have been small and hardly enough to justify increase in cost. It did appear, however, that a pre-stressed concrete tank would effect a greater total saving of steel.

At Cromer an order had been placed for a 200,000 cu.ft. spirally-guided holder in steel tank for erection in 1953. In view of the demand for the comparatively small amount of steel allocated to the Board, it did not appear that this programme could be adhered to, as some 200 tons of steel was required for this comparatively small holder. A pre-stressed concrete tank was given serious consideration. With the co-operation of the gasholder contractors, Newton Chambers & Co., Ltd., discussions were held with Preload (Great Britain), Ltd., to explore the possibilities of this form of construction for the Cromer project.

The following facts emerged:—

(1) The adoption of a pre-stressed concrete tank instead of a steel tank would cost approximately 6.8% more at the prices ruling in July, 1952.

(2) The holder with steel tank required 195 tons of mild steel, together with at least 5 tons for the foundation, whereas the holder with a pre-stressed concrete tank could be built with 113 tons of mild steel and 6 tons 1 cwt. of high-tensile steel wire, thus offering a saving of 82 tons of steel.

The Manufacture and Distribution Committee of the Eastern Gas Board had recommended that, where the increased cost was below 10%, alternative methods of construction which showed a substantial saving in steel should be adopted, and it was decided to proceed with the pre-stressed tank at Cromer, especially as this meant that work could be started in the autumn of 1952.

This is the first pre-stressed gasholder tank to be erected in the British Isles, and possibly on the Continent.

Site Investigation and Conclusions

In view of the sandy nature of the sub-soil at Cromer, together with the fact that we had no knowledge of the sub-strata of the holder site, it had been previously arranged that a site survey should be carried out by Soil Mechanics, Ltd.

Exploration revealed that the ground consisted of formations of fine and medium sand, sometimes containing silt or gravel and calcareous silty clay. The sand deposits predominated. The least favourable conditions were encountered at the centre of the proposed new holder. There was no water until about 40 ft. below works datum.

The sands varied in density from very compact to very loose, and angles of shearing resistance of 39° and 34° were measured, the former in the densest formation and the latter for the two other strata. It was pointed out that the ultimate bearing capacity of these cohesionless soils depended on the size of the loaded area and the depth of the foundation, but at the Cromer site the sands at all levels and under all conditions were capable of supporting pressures of 1 ton per sq. ft. with more than adequate factors of safety against shear failure of the soil. The ultimate bearing capacity of the silty clay, calculated from the results of tests on the weaker samples, was about 3.8 tons per sq. ft. and was independent of the size of the loaded area and depth. This also gave an adequate factor of safety when the loading was 1 ton per sq. ft.

It was reported that under the least favourable conditions the settlement due to consolidation of the strata of silty clay should not be more than about 1 in. Even if formations of compressible soil existed at depths below the level explored, the total movement should not exceed 2 in. to 2.5 in. Nevertheless, differential movements between the centre of the tank and the periphery to the order of 1 in. to 1.5 in. might develop.

A foundation tender had been obtained for a reinforced concrete raft for the gasholder originally designed in steel tank; but when the decision was made to use a pre-stressed concrete tank it was considered advisable to have the foundation raft carried out by the tank contractors—Preload (Great Britain), Ltd. The firm was quite happy to place the foundation slab on the upper sandy layer at a depth of between only 2-3 ft. below ground level.

In view of the possibility of differential settlement between the periphery and the centre, Newton Chambers & Co., Ltd., designed the crown framing to be self- supporting, dispensing with the centre supporting column included in the original proposal, thus transmitting the 8-ton load which would have been on the centre column to an even spread over the rest blocks.

A 12-Month Guarantee

In accepting the design, both the gasholder contractors and ourselves considered that a reasonable guarantee should be given, and Preload (Great Britain), Ltd., agreed that the maintenance guarantee should extend over a period of 12 months from commissioning the gasholder.

One further small investigation was carried out before we accepted the tender, and this was the possible action of gasholder water on the concrete. Two samples of water, one from a holder at Cromer and the other from a holder at Norwich, were tested. Both waters carried substantial amounts of alkalinity, but had moderate contents of sulphate. These features did not indicate that adverse action on portland cement would be expected, but we were advised that any risk that would attach to the concrete could be covered by ensuring a good quality resistant mix and by periodical, but regular, inspection of the concrete structure, with occasional analyses of the water.

The Preload Company considered that the water would not have any deleterious effect at all upon the dense impervious concrete which they would use.

Design of Pre-stressed Concrete Tank

The design of the pre-stressed concrete tank was undertaken by Preload (Great Britain), Ltd., and makes full use of the firm's machine for the circumferential pre-stressing of a circular tank. It is, of course, a specialist process rapidly gaining more application.

Shrinkage in reinforced concrete tends to place the concrete in tension and the reinforcement in compression, whereas the reinforcement is usually designed to be in tension; thus, the pre-stressing of reinforcement to overcome the shrinkage effect, together with other sources of tension in the concrete, has been the subject of research for many years. The Preload and other systems have been developed as an improved method of constructing concrete structures designed to be circular in plan and in which the concrete members when carrying their working loads would be in tension if not pre-stressed. The principle of pre-stressing by banding circular elements is

not new, but I believe it was first applied to tank construction about 1921. The Preload system was developed in America only 10 years ago.

The basic design of the wall of a gasholder tank is similar to that of any open storage tank; but with a spirally guided gasholder, where the carriages taking the guide rails of the outer lift are mounted on baseplates fixed to the top of the tank wall, a complex system of loads is transmitted to the top of the wall by wind action on the fully elevated holder. The two main effects of this are the application of additional bending moments to the top of the wall at the carriage positions, together with a tendency to cause the top of the wall to distort. Clearances allowable in the working of the gasholder are only fractions of an inch, so that distortion of the top of the wall must be almost entirely prevented. In the Preload design this is achieved by providing a stiff ring around the top edge of the wall heavily pre-stressed to overcome the stresses which would otherwise result from the circumferential bending moments. The load applied at the carriage baseplates is readily dealt with by the provision of suitable vertical pre-stressing units in the form of Lee McCall bars.

Monolithic construction of the floor, footing ring, and wall of the tank is the most satisfactory structural arrangement; and the gasholder tank at Cromer was small enough to allow of this. With tanks of over 1 mill. gal. this becomes uneconomic, and there must be a special watertight joint made between the slab and the walls of the tank.

The Preload system makes use of pneumatic mortar as the most suitable material for the construction of thin floor sections and as the only material for the covercoat to the circumferential wall wires. It also can be effectively used for the construction of the core wall, thus making it the primary material of construction for the entire structure in place of the more usual poured concrete. This material is more familiar to gas engineers in its application under the proprietary name of 'Gunite.'

The proposals in connection with the concrete work were in conformity with British Standard Code of Practice No. 114 and also with the Code of Practice for the Design of Reinforced Concrete Structures for the Storage of Liquids, Supplement 1, 1944, issued by the Institution of Civil Engineers.

Description of Work on Site

The construction of the floor of the tank differed from normal practice to the extent that pneumatic mortar was used above the reinforcement. A blinding layer was put down in the usual way and this varied from 2 to 3 in. in thickness, thus taking up the slight irregularities of the excavation. Spacers made of small concrete blocks ¾ in. thick were placed on the surface of the blinding layer to take the B.R.C. fabric (B.S. 123).

Pneumatic mortar was then applied in two layers, the first 1¼ in. thick and the second ¾ in. thick, thus forming a 2-in. layer of concrete, which was designed to form the waterproof membrane of the tank bottom. The ring foundation to the wall was cast in the usual manner and afterwards covered by the 2-in. layer of pneumatic mortar which thus formed a continuous layer over the whole of the bottom of the tank.

The thickness of this concrete was queried at the time, but it had been amply demonstrated in America, and, indeed, in this country, that a 2-in. layer of pneumatic mortar is normally adequate. However, this subsequently proved to be the weak link of the construction—not because the theory was unsound, but because of the necessity of ensuring correct placing of the pneumatic mortar.

Dowel bars were left projecting around the periphery of the tank base to join up with the wall; and immediately the tank bottom was finished, erection of the inside scaffolding commenced. A certain amount of scaffolding for the outside had already been started while the inlet and outlet pits were being completed. The walls were built by erecting 'Kwickform' shuttering on the inside, and this sectional type of shuttering had to be supported for the full height by scaffolding. The contractors erected a centre tower to a height of 30 ft., and the inside scaffolding was braced back to this tower. A minor difficulty was experienced in lining up the top edges of the 'Kwickform' panels due to slight imperfections in the level of the floor, though this had been laid to the usual concrete limits. To overcome this it was decided to fix the bases of the 'Kwickform' panels exactly and to key these by scaffolding to the centre tower. Once this was accomplished the remaining rows were kept quite level.

While the scaffolding and shuttering were being erected, wooden boxes were set at tank floor level and positioned in the steel reinforcement in order to form a pocket for the lower end of the Lee McCall bars, but the boxes were not finally fixed in position until some 2½ in. of pneumatic mortar had been placed on the wall.

'Gunning' of the surface of the lower half of the wall of the tank started on November 17, 1952, and during the first day a layer was completed 5-6 ft. high and ¼ in. thick. The procedure continued for a number of days until the first difficulty was experienced.

Difficulty from Weather

The shuttering for the first section of the tank wall—*i.e.*, approximately half the total height of the wall—had been covered with an average thickness of about 1 in. of pneumatic mortar, when unfortunately the air compressor broke down. The replacement machine was despatched by the contractors at once, but there was some delay in transit and before 'shooting' could be resumed small cracks were noticed in the thin concrete of the higher part of the wall. The mortar is applied in layers; and although the average thickness was about 1 in. and there was more material than this at the bottom, at the top portion the concrete was only about ⅜ in. to ½ in. thick.

The placing must be a continuous process as nearly as possible. Normally, if there is any suspension of the work, the surface must be kept moist until concreting is resumed. In this instance this proved impossible, as high winds, with frost, occurred, with the result that frost cut down between the mortar and the shuttering before the cement had taken its final set; and cracking took place. On inspection, Preload, Ltd., had no hesitation in stripping-off the whole of the concrete that had been placed and starting the whole job again.

It would, of course, have been much simpler to have stopped work on the job and resumed again in the spring when all danger of hard weather and frosts had been eliminated. However, both Preload, Ltd., and Newton Chambers agreed that in all contracts of this nature undertaken during the winter, it became a case of 'beating the weather'; and they preferred to continue after agreeing upon the precautions to be taken to avoid further trouble. It was decided that:—

(a) 'Gunning' was not to be started within four hours of the time frost was expected. To determine this, in addition to local weather forecasts, the contractors subscribed to the Imcos Weather Service, from whom they received weekly forecasts which were supplemented by daily reports when frost became likely.

(b) If 'gunning' had started it must stop two hours before frost was expected.

(c) Any concreting which had been completed and was then subject to frost was to be carefully examined for any signs of cracking, if necessary by warming with a blow lamp. Any freezing would then be disclosed by disintegration of the concrete. The work was then to be stripped-off completely.

The work was started at the beginning of October, 1952, with the intention of securing completion of the tank early in 1953. This, of course, was based on the assumption that reasonable weather with no frosts might be expected up to, say, the middle of December. Unfortunately for us and the contractors, the weather deteriorated almost as soon as work commenced. 'Shooting' on a vertical surface is a skilled operation at any time if the mortar is to be correctly applied and the amount of rebound kept low. The prevailing conditions of high wind made the placing of the mortar much more difficult. This, coupled with delays due to frost warnings,

slowed-up the progress of the work. On a number of days no work at all was possible due to frost and snow, and erection of the second lift of 'Kwickform' shuttering was delayed on several occasions as the wind was too strong to permit the fixing of the shuttering.

The second section of the wall was placed in January, 1953. Then followed the tricky job of erecting the steel for the gallery beam and fixing templates for the carriage holding-down bolts. The accurate positioning to fine limits of these templates was not an easy matter, in view of the amount of scaffolding and reinforcing steel at tank top level. As soon as approximately 3½ in. of pneumatic mortar had been placed, the Lee McCall vertical bars (post tensioning units) were positioned by placing inside 1¼ in. external diameter conduit tubing. The system uses alloy steel bars provided with fine screwthreads to take special anchor nuts which, when fully tightened, develop 98% to 100% of the ultimate strength of the bars. The alloy steel bars are made from 'Macalloy' steel.

Concreting recommenced in February. In addition to continuing with the top half of the wall, the core was placed between the tank bottom and inside of the wall. The rest blocks had been prepared and these were fixed by drilling holes in the tank bottom, grouting-in ½ in. diameter dowels and then placing the rest blocks.

The wooden formwork in the gallery ring beam was placed early in March, and the carriage holding-down bolts were positioned; but before the concreting of this ring beam was completed, it was necessary to stress the Lee McCall bars. To do this, a load of approximately 18.6 tons was applied by a hydraulic jack to give tension in the bar of 94,000 lb. per sq.in. The final tension in the bar, after allowing for losses due to creep and shrinkage, was 80,000 lb. per sq.in., and resulted in an increase in length of 1.25 in. on the total length of the bar, originally 27 ft.

Concreting of the gallery ring beam was completed by the end of March. Before this was finished the grouting-in of the Lee McCall units had been accomplished. This was done by forcing cement grout by air pressure through connections at the base of the conduit sheath around each stressing member until it exuded from beneath the top anchor-plate of the bar.

'Winding' of the Tank

The next operation was the pre-stressing or 'winding' of the tank. Before this could be done, it was necessary to dismantle the whole of the scaffolding. The machine used by Preload, Ltd., was a new one which, I believe, had only previously been employed on a water tank of smaller dimensions; and some alterations had to be made initially—mainly on account of the complication caused by the gallery of this tank, especially in view of the projecting carriage holding-down bolts. Once these were overcome, the actual operation of pre-stressing the tank did not take very long.

The operation of stressing the tank was completed on May 9. The winding carriage was then removed to make way for a cradle attached to the top carriage and which could be hoisted up and down, thus forming a platform from which the 'shooting' of the cover coat was carried out. This work proceeded satisfactorily, and by May 14 there was ½ in. thickness all over the stressed wire. Even during this period high winds caused difficulty in placing the pneumatic mortar and resulted in a comparatively high loss or rebound. This difficulty persisted until the end of the job, and the finish of the external coat of concrete is not as good as either the contractors or ourselves anticipated.

Testing the Completed Tank

Though it was anticipated that the tank would be perfectly water-tight, it had been agreed by all parties that a thorough test should be made before erection of the holder was started. Fortunately, we have our own well water supply at the Cromer works and filling of the tank with water commenced on June 4. However, by the morning of June 6, when the water was 4 ft. 3 in. deep in the tank, we were disappointed to observe a slight leakage at the base of the wall over the outlet-pipe pit. Pumping was stopped so that this could be observed, especially as a number of damp patches were also discovered around the base of the wall.

As the rate of leakage appeared to be low, pumping was resumed after a few days, but by the time the height of water had reached 16 ft. on June 18 six definite leaks were found around the base of the tank, while several others were suspected, and the rate of drip now observed at both inlet and outlet pipe pits had increased.

Filling was continued until the height of water reached 27 ft.; and on June 25 it was decided to empty the tank to ascertain the cause of the leakage. This emptying took until July 9.

Emptying and Retesting

On inspection, it was found that the holding-down bolts of the pipe supports had not been grouted-in, and it appeared to be a reasonable assumption that the leaving of these holes was the cause of the leakage, as this would allow water to pass through the layer of pneumatic mortar which formed the waterproof membrane directly into the blinding layer of concrete, which was not impervious, and thus to the edges of the tank slab.

It was decided to repair these and re-test; but as some holes had been cut away at the base of the wall in order to examine the places where water could be seen leaking, these, in addition to the grouting of the holding-down bolts, were made good by using 'Pudlo.' On completion of this work, pumping-in water for the second test was resumed on July 11 and continued until a depth of about 10 ft. was reached on July 17.

To our disappointment leakage again became evident, even under this head of water, and attempts were made to measure the loss by fitting a vertical pipe into the water supply pipe so that this acted in a similar manner to a single-column water-level gauge.

Even with the water only 10 ft. high, it proved impossible to obtain an accurate measurement inside the tank due to the surge or wave action on the surface of the water. Though it was difficult to take accurate daily measurements, it was agreed that with 10 ft. of water in the tank it was losing approximately 1 in. in seven days, and it was decided that there was little point in proceeding with the full test. Emptying of the tank was, therefore, commenced on August 1 and was completed by the 6th.

A further 1-in. diameter hole was discovered which had not been grouted-in at all, and several shrinkage cracks were noticed in the floor concrete. In addition, the pneumatic mortar around the inlet and outlet pipe flanges did not appear to be as solid as could be desired. The discovery of a small sand pocket in the concrete at the base of the tank wall exterior was also discussed; but in view of the fact that the covering was thicker than originally designed, this was not considered to be serious. However, further checks were made, especially to ascertain whether any seepage was taking place at the position of the Lee McCall bars. It was also noticed that the pattern of the 10-gauge fabric placed in the vertical wall could be seen quite clearly in various places; but further examination proved that there was adequate concrete cover.

Making Good

Various ways of making the tank tight were discussed. Finally it was agreed that the few cracks that were discovered should be cut out and made good, together with the other small points, and the floor washed over with a proprietary concrete sealing liquid and again re-tested. Although we had some doubts about the result of this, it was considered that it should be done as suggested by Preload, Ltd., who had never previously experienced failure of a concrete tank in this manner.

On cutting out the cracks, it was found that sand and pneumatic mortar of poor quality lay between the joint of the two layers of concrete, which obviously would allow leakage to take place. The defective areas were cut away extensively until sound concrete was found. During this examination a possible faulty place in the core was discovered and repaired with cement and 'Sika' grout in a similar manner to the floor cracks.

(*Continued on p. 482*)

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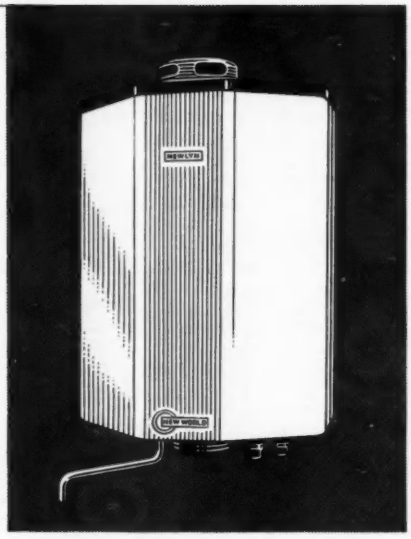

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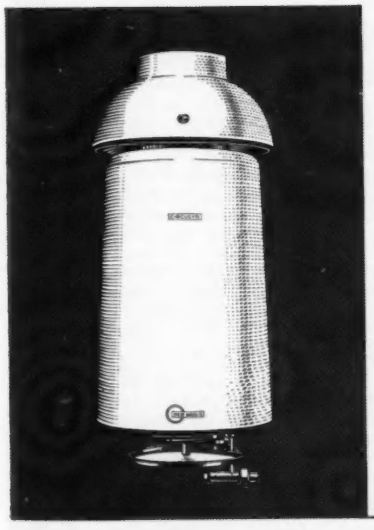

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Although it was not proved that there had been any leakage around the inlet and outlet pipes, the concrete was cut away in a 'vee' groove and the place filled in with a malleable plastic compound. Concrete was also cut away on the outside wall, and though the cover in one place was found to be less than expected, the wires were bright and clean and showed no signs of rusting.

Finally, the walls inside the tank to a height of some 6 ft., together with the floor of the tank, were coated with 'Paintcrete.' Once again the weather did not favour the contractors; and twice during this process the work was spoiled by storm rainwater. Filling commenced on September 5 and the depth reached 10 ft. by the 12th.

At this stage damp patches were remarked once again at various places at the base of the wall where it joined the ring beam, and a little water was observed in both the inlet and outlet pipe pits at the surface of the ring beam. However, it was decided to continue filling to the full height so that some measurement of the loss could be made, and various devices were suggested to overcome the difficulty caused by the wave effect on the surface of the water. In the end, the most successful device was made by the works staff at Cromer and consisted of a 5-in. diameter steel pipe having a plate welded across the bottom containing a $\frac{3}{4}$-in. diameter hole. The bottom of this pipe was approximately 7 ft. below the surface of the water, and inside it was fitted a small metal float with a rod attached working in a vertical sleeve. Measurements were taken from the top of the pipe to the top of the rod, and this completely eliminated the fluctuations caused by wind action.

Corrections were made for rainfall, and both the water temperature and the maximum and minimum air temperature were recorded.

During the week ended October 9, the leakage rate amounted to 737 gal. per day, but this reduced to 343 gal. during the week ended October 16, thus indicating that some making-up was taking place. During the third week the rate was 340 gal. per day and continued approximately at this figure until the end of the test on October 27, when it was decided to proceed with emptying the tank. As soon as the tank was dry, a further meeting was held (on November 9) and it was agreed that there were no signs of any structural defects in the floor. In fact, not even any hair-cracks were visible. It was therefore agreed that the leakage must be due to the porosity of the concrete. In this instance the 2-in. thickness of pneumatic mortar was not forming an impervious membrane.

Once the cause of the leakage had been decided, it was agreed that a watertight membrane would have to be made by some form of bitumastic coating, and Preload, Ltd., obtained expert advice. The result of this is that the tank has finally been made waterproof by applying four coats of Wailes Dove 'Bitumastic' solution.

Summary and Conclusions

No attempt has been made to minimise the difficulties experienced in the construction of this gasholder tank. The resultant delay in securing completion of the gasholder has naturally caused much concern, especially in view of the greatly improved position regarding deliveries of steel. However, this was pioneer work so far as the application of pre-stressing to a concrete gasholder tank was concerned. In any case, the most serious delay was not due to the design or the pre-stressing system. Whether or not this type of tank will be adopted in the future if steel is freely available does, therefore, seem to depend upon the following factors:—

(1) Whether the difficulties experienced at Cromer can be overcome and the time required for construction of the pre-stressed tank reduced.
(2) Whether there is any financial advantage in using pre-stressed concrete compared with steel.

The answer to the first point is almost certainly in the affirmative. Given normal conditions and adequate workmanship there is little doubt that a gasholder tank of this size could be constructed in pre-stressed concrete in about 16 to 18 weeks.

The question of finance is not so easily answered, as in view of the Cromer experience I am uncertain as to whether the cost of any future project will be reduced or increased.

In assessing the problem, the cost of maintenance must be taken into account. Though this has yet to be proved, it is reasonable to assume that the concrete tank will require no maintenance apart from the painting of the ladder and handrails, which are of steel.

At Cromer a steel tank would require painting at least once every two years. The work of preparing the surface and applying two coats of paint at present-day prices would cost £200, excluding the work on staircases, handrails, etc., which will still be required with the concrete tank—*i.e.*, £100 per annum.

It appears that the additional cost will be paid for in 17 years; or, if the life of the holder is taken as 60 years and painting carried out every two years as suggested, over the life of the holder the pre-stressed tank will result in a saving of a little over £4,000.

(Our report of the discussion will be published next week.)

FLUID GASIFICATION OF OIL

A study of the application of fluid cracking techniques to high calorific value oil gas production is presented in I.G.T. Research Bulletin No. 16, 'Fluid Gasification of Oil,' by J. M. Reid, W. J. Merwin, C. G. von Fredersdorff, H. R. Linden, and E. S. Pettyjohn.

Fluidisation studies were carried out in small-scale laboratory units. The most promising materials were tested for the following desirable characteristics as heat-transfer media: (1) High thermal conductivity, (2) high specific heat, (3) high density, (4) high softening point, and (5) resistance to attrition. Of several commercially available materials meeting these requirements, dehydrated silica gel was chosen for pilot-plant tests.

Fluid gasification studies were made with a two-barrel per day pilot unit in which both distillate and residual oils were gasified. It was found that, in a fluid bed reactor using a given heat-transfer medium, the process variables which affect the results of gasifying oils are similar to those controlling gasification results in other types of equipment. The gasification results obtained in the fluid pilot plant are in close agreement with the predicted results based on the fundamental oil gas correlations presented in I.G.T. Research Bulletin No. 12, 'Selection of Oils for High B.Th.U. Oil Gas,' by H. R. Linden and E. S. Pettyjohn.

The work was conducted by the Institute of Gas Technology, Chicago, under the sponsorship of the American Gas Association.

COKE FOR WESTERN AUSTRALIA

The Government of Western Australia recently asked for the co-operation of the Fuel Research Station of the Department of Scientific and Industrial Research on an important problem. Western Australia has no caking coal, but possesses iron, and needs foundry coke for its treatment. Coke for such use is made normally from coking coal. The Fuel Research Station has been concerned in experiments to find out if a non-caking coal could be used instead, in the form of carbonised briquettes. Good quality briquettes were made in collaboration with a commercial firm, and have been sent to Australia for trials.

Laboratory scale experiments in Western Australia indicated the possibility of making coke from local resources of non-caking coal. The process involved carbonisation of the coal, followed by briquetting of the char with pitch and, finally, carbonisation of the briquettes.

Samples of char manufactured from the non-caking coal available in Western Australia were received in England for tests on a larger scale. After some preliminary experiments at the Fuel Research Station to find the best conditions for doing so, the char was mixed with pitch and pressed into briquettes by Yeadon, Son, & Co., of Leeds, in commercial scale plant. When these briquettes were carbonised at the Station they gave a hard, dense coke. Enough briquettes were sent to Australia for trial in a metallurgical cupola. Their performance was promising. The Australian authorities are now considering the establishment of the process.

There is one disadvantage of making briquettes from the char which will have to be overcome before the process can be used on a large scale. The char is extraordinarily abrasive and causes a lot of wear on grinding and briquetting plant. Because of this, small scale experiments were done on making briquettes directly from the uncarbonised coal and then carbonising the briquettes. These experiments gave cokes which were too weak to be useful.

HOW MABLETHORPE COPED WITH FLOOD

FROM A PAPER TO THE EASTERN SECTION OF THE INSTITUTION OF GAS ENGINEERS, ON FEBRUARY 18, 1954, BY

J. W. WILSON,

Divisional Distribution Engineer, Lincolnshire Division, East Midlands Gas Board.

The tragedy and suffering wrought by the gales of January, 1953, on the East Coast remain vividly. No words of mine could adequately express the desolation and chaos caused by the floods. That most of the affected areas are now completely rehabilitated is a magnificent tribute to those who worked to this end.

Regarding gas supplies, the most seriously affected area of the East Midlands Gas Board was the town of Mablethorpe and its immediate neighbourhood, Trusthorpe and Sutton-on-Sea.

Before the Floods

Mablethorpe was supplied by a network of low pressure mains, the town pressure being governed at the works by an 8 in. diameter water-sealed type governor set at 6.5 in. w.g. during the day and reduced to 4.5 in. w.g. at night. A 6 in. diameter high pressure feeder main supplied Trusthorpe and Sutton-on-Sea, a distance of approximately 3 miles. Connections off this main were: (i) A 4 in. diaphragm governor feeding the south end of Mablethorpe; (ii) individual high to low pressure service governors to all consumers in Trusthorpe; (iii) a 6 in. diaphragm governor feeding Sutton-on-Sea: and (iv) a 6 in. diaphragm governor feeding the Sandilands area.

The working pressure of this main was from 3 lb. per sq. in. to 5 lb. per sq. in., being supplied out of the holder by a rotary compressor capable of delivering 12,000 cu.ft. per hour at 5 lb. per sq. in.

Mablethorpe Under Water

First intimation of the flooding to reach divisional headquarters of the East Midlands Board was at 11 p.m. on January 31, when a report was received to the effect that the whole of Mablethorpe was under water and the population was being evacuated. By 2 a.m. on February 1, staff from Skegness and divisional headquarters had reached Mablethorpe. By this time the flood water, which in two hours had reached the level of the bottom of the primary air slides on the retort house producers, had receded slightly. There was no immediate danger to the works until the following high tide at about 7.30 a.m. Relief men were unable to reach the works, but the stokers remained on duty for a double shift so that there was no cessation of gas-making.

At 3 a.m. that day the stock position was examined and it was estimated that approximately 50,000 cu.ft. of gas more than normal had been distributed and stock was still declining. Because of the depth of flood water in the streets and the wind force it was impossible to make a reconnaissance of the district until daylight. With the limited staff available, emergency measures were taken. The doorways to the retort house were sandbagged, and a pump was obtained from Skegness to cope with further possible flooding.

The next tide—7 a.m. to 8 a.m.—did not reach as high as the previous tide. Steps were at once taken to trace other stokers and any staff remaining in the town, and arrangements were made to draft in personnel from Louth and Lincoln. During the evening it was possible to make a reconnaissance of part of the town, and the valved supply controlling the beach chalets which had been destroyed was successfully closed.

Damage Survey Commenced

On the following morning all the resources of the East Midlands Gas Board were placed at the disposal of the Lincolnshire Division. Board Headquarters had instituted stand-by arrangements throughout the area in respect of labour, materials and plant, all of which were on call at immediate notice. Assistance was generously offered by contractors and appliance manufacturers associated with the gas industry. In several ways their aid proved most effective.

A survey of the prevailing conditions was made, and the Mablethorpe distribution staff was reinforced by fitters and mainlaying personnel from Louth, Boston, Lincoln, Skegness, and Grimsby. The town was divided into districts; and parties were sent into each district, led by someone responsible accompanied by an employee

Fitters removing a meter from a house which had been flooded, after plugging off the gas service. The enormous quantity of silt left behind by the flood water is clearly visible.

with a knowledge of local conditions. At this stage contact with Sutton was impossible due to the depth of flood water. A reconnaisance party was sent to Alford to obtain a D.U.K.W. from the Army. A similar survey of Sutton was attempted. These surveys were maintained until dusk, when the reports were collated.

It was found that the high pressure main was intact as far as Sutton, and that gas was available to the few consumers remaining. The Sandilands area at Sutton was, however, completely cut off from gas supply. Half the low pressure distribution system in Mablethorpe was cut-off either by broken or by flooded mains; and the bulk of the gas stock which had been lost was due almost entirely to broken services and meter connections.

Three sections of 4 in. diameter main on the front supplying chalets had been lost. The ends were valved-off or repaired, and about 25 broken services from 2 in. diameter to ¾ in. diameter were capped-off. All accessible meter cocks on consumers' premises were closed. Liaison with the police was established, and approval given to the procedure to be followed in cutting-off supplies and recovering meters. Where houses were accessible, gas was turned off and 'suspect' meters were removed.

Where premises were locked, forcible entry was made only where a gas escape was suspected. Wherever possible such entry was made only under police supervision. Sandbagging the danger points on the works continued as a precaution against the high tide of February 15.

On Tuesday, February 3, 1953, it was obvious that the road approach to Sutton would be passable. A party was sent in as far as it could go, and from Bohemian Corner, Sutton, the survey was carried out on foot. Complete evacuation of civilian population over an extended area and indefinite period had been effected, and it was obvious that, after carrying out the emergency work of finding and repairing escapes, no useful purpose would be achieved until sand had been cleared.

No stores control was possible until the following day.

due to lack of staff. However, since the remainder of the undertaking's personnel had reported for duty, full stores control was re-established and a record of receipts and issues during the emergency period was compiled.

Restaurants and cafes in the High Street area of Mablethorpe were re-opened to supply meals for police, salvage workers, and the influx of civil engineering personnel. Efforts were concentrated on servicing their appliances and providing additional gas points and vegetable boilers to cater for the exceptional demands thrown upon these establishments.

A survey of the high pressure main was made along the Mablethorpe-Sutton coast road. The gas supply was checked in a number of houses, and was found to be satisfactory. Spot pressure tests on the length of this main confirmed that as far as Sutton the main was intact. In view of the decreased output of gas, one bed of horizontal retorts was shut down to enable an early start to be made on the planned resetting to foundation level. Another was maintained under slow firing, leaving the remaining two operating on a reduced charging schedule.

Mains Work Resumed

The success of the district work of cutting and capping the broken mains, services, and meter connections since February 1, was reflected in the gas-making and stock position, which on February 5 was steady at about half the normal daily output for the time of the year. Taking into consideration the emergency out-of-season catering load superimposed on the normal output, it was considered that the part of the distribution system in use was reasonably sound.

The flood water by that time was receding to a level at which work could be resumed on the mains, and the problem of pumping the flooded low pressure system could be planned. Essentially, the first step to be taken was to form a clear picture of the distribution system and of the pressure conditions. What we did was to form a 'distribution spider'—merely a line tracing of the actual mains and syphons radiating from the works, together with landmarks such as rivers, coast line, railways, and contour lines, and without Ordnance details of roads and buildings. From the 'spider' it was a straightforward task to select pressure points along the more important supply mains, junctions, and extremities of supply and to carry out a comprehensive and simultaneous pressure survey of the whole undertaking over a seven-day period. It was decided to construct a mains 'spider' from the several existing 1/2,500 Ordnance sheets covering the affected area.

The district work of recovering damaged, submerged, and partially submerged meters was accelerated now that premises became more easily accessible.

Pumping of syphons was commenced on February 6, and two 600 gal. syphon tanks from Grimsby and Lincoln were brought in. The location of syphon covers was difficult because of sand and debris, and because of the changed characteristics of many streets, in which houses and boundary walls had been demolished. However, all the syphons on the high pressure Sutton main were located and the amount of water withdrawn was normal. This confirmed that the main was intact.

Consumers Return

By Friday, February 13, the whole of the low pressure distribution network was clear of water with the exception of the two 'lost' mains on the foreshore and a small area cut off in Trusthorpe Road. Three consumers requiring gas in this latter area were supplied by a temporary overland connection from the H.P. main.

Consumers were now beginning to return and to demand gas supplies. Notices were posted throughout the town advising people returning to their homes to call at or telephone the gasworks, showrooms, or any service van on the district, if they required gas or experienced any trouble with their appliances. Four service vans toured the district. They were on immediate call to any consumer requiring services.

Stocks of meters and fittings had been transferred into Mablethorpe stores, and a 24-hour service for consumers was being effected. Specific complaints, such as affected appliance maintenance, were dealt with by fitters only, but 'no gas' complaints were subjected to a comprehensive treatment of a combined team of men including a service-cleaning unit, service layers and gas fitters.

Throughout the whole of the emergency the 6 in. diameter H.P. main to Sutton remained unaffected except for the leakage reported on the night of Sunday, February 18. Initially, the Sutton L.P. system was intact, but as Army and contractors heavy plant and machinery began to bulldoze and plough their way through the morass of silted rubble on Sutton's roads, the mains began to suffer, and sections of the town were cut-off from gas supplies.

However, as there was a complete evacuation of civil population, there was no immediate sense of urgency. The problems were tackled in an exactly similar manner to those at Mablethorpe.

DISCUSSION

The CHAIRMAN, Mr. Bernard Clarke, M.B.E., thought the most commendable thing about the paper was that it was factual and without embellishment. It showed the work that had been put in by everybody under the conditions that prevailed.

Mr. F. BEAUMONT (Mablethorpe) said that Mr. Wilson's efforts during the floods were very much appreciated, and he thought the author had been very modest in the presentation of his paper. It described a major operation that had gone forward under his supervision without a hitch. One thing the disaster had instilled into the minds of those concerned was the value of a well-organised division and board. Men and materials were available in record time. The way the task was carried out, quickly and efficiently, had enhanced the prestige of the industry.

Mr. L. B. CHAPMAN (Skegness) said he had thought when reading the paper: 'Clearly this is not for criticism.' It was a factual report of the work done and of results achieved in exceptional circumstances. He wanted to make two observations. When the population began to return—some 2,000 gas consumers—there were two prime considerations for the gas engineer. The first was to give a supply of gas as quickly as possible, and the second was to give it with safety. Special emphasis has been given to that aspect. It was clear also from the paper that there was a considerable amount of transport required in the work. Constant visits had to be made and constant checks. One vehicle covered over 1,500 miles during the month of February. In regard to Sutton-on-Sea, when the population came back to that town a 6-in. diaphragm governor jammed and was for some time unable to be operated at peak load periods. Finally it was decided to put in a 2-in. governor temporarily; and this proved to be a simple and effective method for the limited demand they had for a time.

Mr. J. T. BROOKES (Norwich) had no doubt that at Mablethorpe it was a question of storm and tempest, not as it was in some other areas on the East Coast where the floods seemed to come up without any indication of where they came from. He asked to hear the author's comments on the effect of salt water on meters. It had been found that some zinc alloy dials with their close proximity to the brass wheels of the index suffered the most incredible chemical reaction in the shortest possible time. It had been found that if a meter was removed quickly, in many cases the salt water had only got into the top of the meter and by hasty repair and spraying with oil it was possible to put it back into service. Mr. Brookes asserted that one might be inclined to wonder why it was a relatively long time—roughly six days—before work was started on the pumping of syphons.

Mr. WILSON chose this moment to reply to Mr. Brookes As far as he was concerned at Mablethorpe, any meters that were taken out of houses were immediately sent to Lincoln, and after that he did not see them. As regards the six days before syphon pumping could commence, the water and sand were so deep that it took that time to get at the syphons.

Mr. A. COLLINSON (Peterborough) said that apart from the water in the mains there must have been a lot of silt and sand. He asked what repercussions had occurred since. Had there been any dried sand or silt or water remaining in the mains? He also asked how the official pressures at the governors were arrived at. What were the maximum and minimum pressures found on the district under normal conditions, with an initial pressure of 6.5 in?

Mr. WILSON answered that they had found at the time that the Allan Taylor clearing units were capable of sucking up the sand as well as the water, and there was no difficulty with getting rid of sand. Since that time they had had a little trouble with sand and silt, and in one case corrosion of a section of main in the middle of the town. This was renewed.

Cooking for large numbers

THE STRATFORD RANGE

This is a general purpose range of modern appearance and high performance, for cooking for large numbers in hotel, restaurant, cafe, hospital, school and works kitchens.
Two models are available.
The oven is Regulo controlled.
Adequate boiling burners are provided.
The range has been designed on the unit principle, consequently wall or central pattern suites comprising any number of units can be supplied. Top bars, burners and oven fittings are easily removed for cleaning.

CONSTRUCTION

GENERAL—Angle iron chassis, cast-iron front frame, base members and door frame, sheet steel side, back and door panels. All taps are of the latest push-in safety pattern.

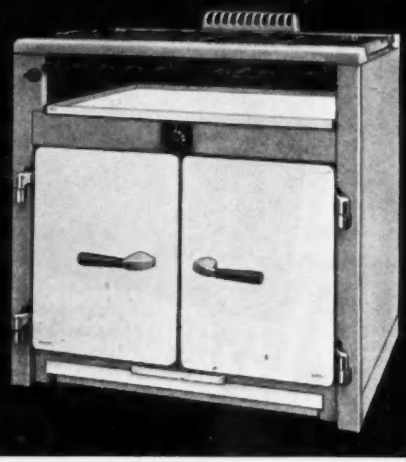
HOTPLATE—Cast-iron front and rear cornice, open-type top bars and drilled ring burners of various capacities. A grill section can be fitted if specified. The burners incorporate specially designed venturi for ensuring maximum flame stability at low gas rates. White enamelled crown plate or plates.

Model No.	Overall			Inside Oven			Hotplate	
	Width	Height	Depth	Width	Height	Depth	Width	Depth
	in.	in.	in.	in.	in.	in.	in.	in.
5127	27	36	31 1/4	21	20	24	27	30
5136	36	36	31 1/4	30	20	24	36	30

OVEN—Sheet steel with insulation 1" thick, fitted with two burners and front-reading Regulo control. Provided with tubular runners and three shelves. Door sealing is effected by means of flexible stain-resisting steel strips.

FINISH—Radar vitreous enamel with top bars and burners black vitreous-enamelled. White vitreous-enamelled door panel (or panels).

EXTRA—Potrack and white vitreous-enamelled backplate. Grill section on hotplate with grill tin and grid.



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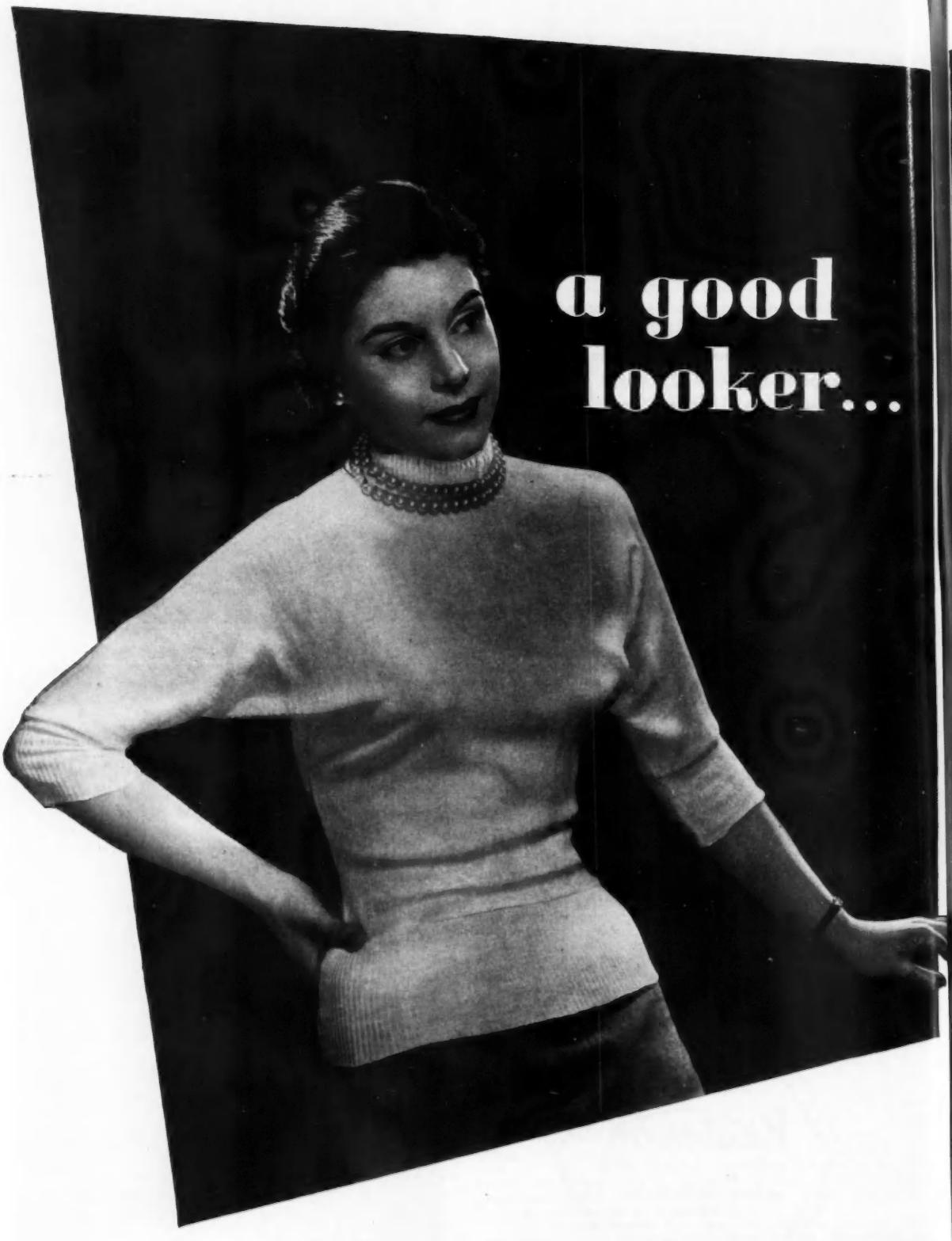
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The Century combines efficiency with pleasing appearance, is particularly easy to clean, having vitreous enamelled surfaces throughout—exterior finished in cream . . . The roomy oven gives a high quality cooking performance with a minimum gas consumption, and the whole of the oven space is available for cooking—the base being particularly suitable for slow cooking . . . Special oven features include Mainstat heat control, flash-tube lighting to burner, easy-clean rounded corners and drop-type door . . . Used oven heat vented in front of backplate and warms double-shelf plate-rack . . . The hotplate has four burners—all can be used for fast boiling *or* simmering—and a large griller. Hotplate fittings can be easily removed for cleaning and the hotplate-well is free from projections and dirt traps.

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MAIN

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GASWORKS WELDING

In the average gasworks practically every kind of industrial maintenance problem is encountered. Wear, impact, heat, abrasion, corrosion and erosion are among the many factors which have to be taken into consideration. It is not surprising that welding is extensively used in the gas industry for maintenance purposes.

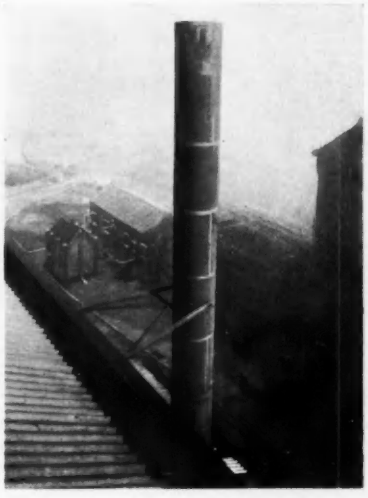
It is noticeable, however, that more use is made of welding in some gasworks than in others. Much, of course, depends on the skill and enthusiasm of the staff concerned, but the variation in the use of welding may be due to the fact that many of the ways in which the process can be employed are not always fully appreciated. Consequently it is of interest to record some of the applications of welding carried out at the Sydenham works of the South Eastern Gas Board. Through the courtesy of the Editor of *The Welder* we are able to give the following interesting notes.

Repair to Riveted Gas Shaft

A recent repair concerns the riveted steel waste gas shaft shown in the accompanying illustration. The shaft is 4 ft. in diameter and has a brick lining. During a routine inspection it was found that many rivet heads had corroded owing to internal corrosion between the steel shaft and brick lining. This resulted in the sectional lap joints opening-up.

To avoid having to renew the stack, a procedure which would have involved considerable delay and expense, it was decided to carry out a repair by welding *in situ*. This was not such a simple task as it sounds, because the top section of the stack was 110 ft. above ground level and positional welding was involved.

Scaffolding was erected and the repair was effected by welding horizontal bands of 1½ in. by ¼ in. mild steel strip around the joints of each section of the stack, the vertical lap joint of each section being secured by a vertical fillet weld. As the top edge of the stack was corroded, it was cut down by 4 in. and the new edge was reinforced with a mild steel band. In our illustration the vertical and horizontal welds can be clearly seen. This repair proved to be entirely successful and credit is due to the works maintenance staff and the welder who carried out the difficult job.



Repair to a Cast Iron Tank

Another interesting repair was made to a large cast iron tank. This tank was urgently required at the works and was delivered by the supplier in sections for assembly. Unfortunately one of the 5 ft. by 5 ft. plates was cracked in transit, and thus the completion of the job was threatened with considerable delay. Another plate was not readily available, and it was decided to repair the section by electric arc welding. This repair was successfully carried out without preheating or special preparation. The plate was first bolted together along its machined flanges with 3 in. by 3 in. angle. The fracture was then ground by hand to form a vee chamfer along the butt joint and the plate was then set level on a plate slab. The welding on the external side of the plate was carried out with a series of 6 in. long stitch welds, using Murex No. 8 gauge 'Cinex' cast iron electrodes. Welding on the other side of the plate was carried out in the same manner, but in this instance Murex No. 8 gauge 'Bronze 44' electrodes were used. The tank was then assembled and considerable delay and expense were avoided.

A great deal of time has also been saved at the works by carrying out repairs by welding to horizontal retort mouthpieces, mouthpiece doors, arch pipes, and ascension pipes. Many of these repairs have been carried out *in situ* under working conditions.

Recovery of Used Firebars

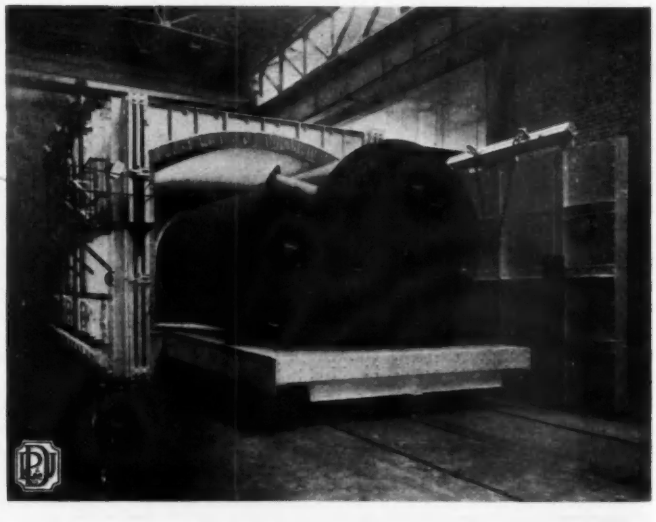
A most useful application of welding at the works relates to the recovery of firebars which have become shortened in use. In effect, sound sections of these firebars are 'cannibalised' by welding to make complete firebars. The rough burnt ends are first burned off and the salvaged sections are joined by welding. In this way very little of the expensive steel used for these bars is wasted.

Hard Facing Applications

Hard facing applied by welding provides one of the most effective methods of counteracting the effects of wear on industrial plant. In a gasworks where large quantities of wet coke and other materials are handled, wear by abrasion and corrosion is severe. At the Sydenham works every opportunity is taken to use hard-facing methods to prolong the life of equipment and components subject to the most wear. The Murex 'Hardex' range of electrodes is generally used for this purpose.

Heat Treatment and Stress Relieving

Owing to the modern use of so many welded steel items of gasworks, chemical, and other industrial plant, it has become increasingly important to provide facilities for the heat treatment, or stress relieving, of various kinds of welded steel components, such as mains, pressure vessels, and other assemblies. To meet this demand, R. & J. Dempster, Ltd., have installed at Gas Plant Works, Newton Heath, Manchester 10, a stress relieving furnace of modern design, capable of accommodating vessels and components up to 20 tons maximum weight. In special circumstances these may be up to 52 ft. in length. The furnace has an operating temperature up to 800°C. and is heated by town gas having a calorific value of 450 B.Th.U. per cu.ft., the furnace being fitted with a Negretti and Zambra three-point indicator and recorder in order to provide efficient temperature control. The clearance dimensions of the furnace are as follows: 9 ft. 6 in. high at the sides, 11 ft. 3 in. high at the crown of the arch, width 13 ft. The length of the furnace is 31 ft. 9 in. This furnace, shown in the accompanying illustration, is also available for the heat treatment, or stress relieving, of components other than those of the firm's own manufacture, and work of this nature can be dealt with expeditiously.



IN PARLIAMENT

Civil Defence

In moving that the Draft Civil Defence (Gas Undertakings) Regulations, 1954, be approved, Mr. Joynson-Hicks, Parliamentary Secretary to the Ministry of Fuel and Power, explained that the first Regulation provides that the Minister may serve a notice on any gas board to ensure that it shall report what measures it is taking for the due functioning of its undertakings. Conversely, the Minister also has power under the Regulations to call upon the board to take such measures for the due functioning of its undertakings as he may think fit.

The second Regulation, he continued, authorises the Minister to pay in these circumstances, out of moneys provided by Parliament, grants not exceeding 52½% of the expenses. In the 1939 Act the figure was 50% the reason being that it was based on a cumbersome and technical mathematic calculation which depended upon the rate of tax. The object of this grant is that it shall be in substitution of the benefits which the industry would be able to derive if it was paying for these due functioning measures out of income and was able to set them off against its tax liabilities and depreciate them in the ordinary commercial manner. What is done, therefore, is that the Treasury and the industry calculate together and agree upon what the tax benefit would be, and this is paid to the industry as a grant on the initial capital expenditure which it incurs. The industry undertakes that it will not claim depreciation or any other tax benefits against the expenditure for which it has received a grant.

The Draft Regulations were approved.

£5 mill. a Year on Mains Repairs

Lieut.-Colonel M. Lipton (Lab. Lambeth, Brixton) asked the Minister of Fuel and Power what steps are being taken to prevent loss of life caused by defective gas mains.

Mr. Geoffrey Lloyd replied that the gas boards are now spending over £5 mill. a year on the maintenance of gas mains, and they had a day and night service to deal with any escape of gas as soon as it was reported.

Lieut-Colonel Lipton: 'Is the Minister aware that recently there have been several unfortunate deaths from this cause, and that in one case it was ascertained that the mains had not been thoroughly examined since they were first laid in 1888? What is being done to speed things up in that direction?'

Mr. Lloyd said that very cold weather constituted a special danger in regard to the fracture of gas mains.

Mr. S. Hastings (Lab. Barking): 'Is there any means of ascertaining when corroding of gas mains has taken place so that leakage is imminent?'

Mr. Lloyd: 'I should have to make special enquiries before I answered that technical question.'

Rural Electrification

Mr. Lloyd, replying to Mr. J. B. Godber (Con. Grantham) on the general progress in rural electrification, said that since the Government's approval of an increase in the capital to be used for rural electrification and his consultations with the chairmen of the boards, there had ben a remarkable increase in the number of farms connected to the electricity supply system. As compared with the year before, the number rose during the last six months of 1953 by 32%, and in the last quarter of the year the number was 4,465, which was 41% higher than the corresponding figure for 1952—a record achievement. Also some 60,000 other rural premises had been connected during the year. This achievement showed how much the boards had increased the pace of this work, and they were now making preparations to carry electricity to the more remote areas.

Gas Industry (Benevolent Funds)

The Minister of Fuel and Power said he was in consultation with the Gas Council about the setting up of benevolent funds by area gas boards.

He was replying to Commander Maitland (Con. Horncastle) who asked what Government arrangements were proposed to enable nationalised industries, such as the gas industry, to create benevolent funds from which pensions may be paid to employees who have been in the gas industry for long periods of time, who are now retiring and to whom existing pension schemes are not applicable.

Smoke Abatement

The Parliamentary Correspondent of '*The Times*' writes: 'Sir Herbert Williams and five other Conservative members have tabled in the House of Commons a motion which will involve a debate on the City of London (Various Powers) Bill, which is a private Bill promoted by the City Corporation. They have given notice that after the second reading of the Bill they will move: "That it be an instruction to the Committee on the Bill to leave out clause 4." This is the clause of the City's general powers Bill which relates to smoke abatement and proposes to take some steps in the direction of making the City a smokeless zone. The other members associated with Sir Herbert Williams in this motion are Colonel Gomme-Duncan, Sir Wavell Wakefield, Sir William Darling, Mr. Erroll, and Sir Alfred Bossom. Their intention appears to be not so much to press seriously for the omission of the clause as to make use of the opportunity to raise a debate on the whole subject of atmospheric pollution in London. Dr. Barnet Stross, Labour Member for Stoke-on-Trent (Central), proposes to table a further motion for an instruction to the committee to require that the City Corporation shall make an annual report over a number of years as to the change brought about in the City's atmosphere by this experiment.'

The Ministry of Fuel and Power is giving consideration to experience gained as members of district committees when appointing new members to gas consultative councils. This assurance has been given by the Ministry to the North Western Gas Consultative Council which had urged that district committee members, rather than complete newcomers to the machinery of consultative councils, should be drawn upon to fill council vacancies as and when they arise.

Considerate Propaganda.—Mr. George Evans, Manager of the North Eastern Gas Board showroom at Slaithwaite, Yorkshire, recently saw an old lady shivering in the cold weather as she waited for a 'bus, so he invited her to wait inside his warm and comfortable showroom. Later a notice appeared in his window: 'To Aged Ladies and Gentlemen: You are invited to wait for your 'bus in the warmth of this showroom'—considerate, and one can well believe effective, gas propaganda. Undoubtedly, the showroom is the warmest 'bus waiting-room in the district.

The Make of Gas at Motherwell has increased in the comparatively short time of 63 years from 29 mill. cu.ft. per annum to well over 1,000 mill. cu.ft. per annum. Forty years ago the Motherwell works was sold to the town council. At that time the manufacture of gas was about 120 mill., and this figure increased to about 800 mill. when the Scottish Gas Board took possession in 1949. This year also marks the diamond jubilee of the introduction of gas cookers and slot meters in the town.

The Winning Entry in the North Thames Gas Board competition for the Board's champion stores during 1953 was the Walham Green (Central Division) store. The storekeeper is Mr. W. Meeks. Each year the Board holds a competition throughout its fittings stores to find the best kept and most efficiently run in each of the seven Divisions. A shield is awarded and hung in the winning stores for the ensuing 12 months. From these winners the Board's champion is selected, to which a 'major' shield is presented, and the storekeeper and his assistant are given cash awards.

Institution of Gas Engineers

London and Southern Section

Dr. J. Burns, G.M., presided at a meeting of the London and Southern Section at the headquarters of the Institution of Gas Engineers on February 16 and announced that at a meeting of the Management Committee held earlier in the day the following officers had been nominated for the 1954-55 session:

Chairman: E. O. Rose (Tottenham, Eastern); *Senior Vice-Chairman:* A. Tran (Northern Division, Southern); *Junior Vice-Chairman:* J. M. Webber (Sussex Division, South Eastern); *District Member of Institution Council:* R. M. Farror (West Surrey Division, South Eastern); *Hon. Secretary and Treasurer:* A. F. Grant (Bow Common, North Thames).

The CHAIRMAN extended a cordial welcome to Mr. J. T. Haynes, President of the Institution.

The J. A. Maclay Prize

Mr. HAYNES, in presenting the James Archibald Maclay Prize to Mr. R. J. Stevens, of the Old Kent Road offices of the South Eastern Gas Board, said one of the finest characters in the Institution of Gas Engineers, and one who had done as much as anybody for helping on the work of the Institution in caring for the younger members of the industry, was Colonel W. R. Glover. For many years Colonel Glover had siezed every possible opportunity to support the Institution in its work for the younger men. In 1946 one of his colleagues, Mr. James Archibald Maclay, died, and that sad event afforded him an opportunity for doing another good turn. In the name of his late colleague and of his fellow workers he instituted the James Archibald Maclay Prize for students in the industry. At that time, although Mr. Maclay was one of the most prominent salesmen in the whole of the industry, there was unfortunately no salesmen's education scheme, and so the prize was allocated to students taking Gas Engineering (Manufacture) and Gas Engineering (Supply), respectively.

In 1952 the Institution revised the whole of its education scheme, and the committee responsible for the operation and application of the fund which Colonel Glover had put at their disposal decided that the prize should be split into three, one for the City and Guilds Gas Engineering (Manufacture), one for the City and Guilds Gas Engineering (Supply), and one for the Institution's own examination in Gas Salesmanship.

Well-Earned Award

Over the years the prize had not been given 'automatically.' In other words, the committee had maintained that to qualify for the prize a student must achieve the standard originally set. There had been occasions when the prize had not been awarded because the adjudicators agreed that the standard had not been achieved.

This year the three prizes had been awarded, and the distinction of being the first winner of the Gas Salesmanship Prize had fallen to Mr. R. J. Stevens.

Mr. STEVENS briefly acknowledged the prize, which consisted of a cheque to cover the cost of selected books.

The rest of the afternoon was devoted to a paper on 'The Preparation of Coal for the Gas Industry,' by Mr. E. M. Myers, F.R.I.C., M.I.CHEM.E., F.INST.F., Divisional Coal Preparation Engineer, Durham Division, National Coal Board. The paper was illustrated with lantern slides, a sound film, and a silent film, and was followed by discussion. The paper, together with a report of the discussion, is published on p. 471 of this issue.

Effect of Dearer Freights

Coal price increases as a result of dearer freight rates operating from March 1 are expected to add an extra £250,000 a year to production costs of the North Western Gas Board. Commenting on the effect of the increases on the Board, a spokesman said that for the time being 'at any rate' higher gas prices to consumers were not contemplated by the Board. It was possible, however, that part of the cost might be added to the price of coke.

Price Adjustment Scheme

Alderman C. E. P. Stott, Chairman of the North Western Gas Consultative Council, who also commented on the increased freight charges, said in Manchester that the automatic price adjustment scheme under which the Gas Board raised the price of gas by a farthing per therm for every 1s. 6d. per ton advance in coal prices no longer existed. 'If the Gas Board considers there should be an increase in the price of gas, then we shall expect it to put its reasons in full before the Consultative Council,' he said.

Thirty gasworks had been closed down for economy reasons and it was probable that savings to the Board would be sufficient to equate the new increase in production costs. 'The question was whether, in fact, they were not entitled to a reduction in the price of gas in view of the economies achieved by the Board,' commented Alderman Stott.

The increased freight charges will cost the East Midlands Gas Board £120,000 a year, according to a statement by Mr. Sydney Smith, Chairman.

'This means,' said Mr. Smith, 'that since December we face total additional yearly costs of nearly half-a-million pounds—gas price reductions to our consumers cost us £160,000, and wage and salary increases £150,000. Our 1952 surplus was only £279,000.

'We shall try to stand by our pledge to carry these charges ourselves and not to pass them on to the consumer. The Board's policy of lower prices has already stimulated public demand for gas appliances and it is our hope that increased volume of gas sales, together with pruning of operating costs wherever possible, will enable us to break even.'

Mr. Smith added that the industry was also faced with the prospect of higher coal prices. 'If this happened and the increase was substantial,' he said, 'the Board might have to consider higher tariffs, but it would ensure that the barest minimum increases were made.'

Heat Transfer by Radiation

Fundamental laws of thermal radiation are to be found in most text-books on heat, but the engineer concerned with practical problems in the heating of buildings, furnace design, illumination engineering, and similar fields needs a knowledge of the actual methods by which radiative transfer may be calculated. Fire Research Special Report No. 2, *Heat Transfer by Radiation* (published by the Stationery Office for the Department of Scientific and Industrial Research, Charles House, 5-11, Regent Street, London, S.W.1, price 1s. 6d.), presents the information which is available, together with tables of functions for use in making the calculations required in solving radiation problems. The report describes the use of the configuration factor, the ratio of the radiation intensity at the receiving element to that near to the radiator, and the considerations which must be taken into account in determining the factor in particular circumstances.

Sheffield Prizegiving

Mr. G. W. Grosvenor, President of the National Federation of Building Trades Employers, was the chief guest at the prize distribution ceremony of the Department of Building of the Sheffield College of Commerce and Technology on February 3, and presented medals, prizes, and certificates to successful students.

The Head of the Department, Mr. W. Alexander, A.R.I.B.A., referred in his report to the work and development in the Department since last year, and said the number of students now exceeded 1,400. The full-time course in building and quantity surveying had been recognised by the Royal Institution of Chartered Surveyors and was, said Mr. Alexander, the best method of entry into the profession. The full-time course in Advanced Building Technology had been recognised for the award of Higher National Diplomas in Building, and these were presented to J. Hall, D. Harkin, P. Longley, C. I. Patnick, G. I. Shaw and E. Taylor, five distinctions having been obtained.

National awards obtained by the Department were: (a) Third place in the Institute of Housing's Management Examination by H. Gregory; (b) Society of British Gas Industries prize for second place in the City and Guilds Final Examination in Gasfitting by E. W. Packard; (c) City and Guilds of London Institute Bronze Medal for first place in the Heating and Ventilating Operatives Course by J. Smith; and (d) City and Guilds of London Institute Silver Medal for first place in the Heating and Ventilating Engineers Practice Final Examination by P. W. Maslen.

Sales of Coke by the North Western Gas Board averaged 46,000 tons a week during the four weeks ended February 7, 1954, an increase of 19% compared with the same period of 1953. More than two-thirds of the total increase was due to the rise in inland sales, which averaged 42,400 tons a week, or 14% more than in the corresponding weeks of 1953. Exports, at an average of 3,500 tons a week, were more than double the corresponding figure for 1953.

Progress in Harlow New Town

A start is to be made within the next few weeks on the development of a completely new town centre at Harlow, Essex, with provision for civic, public, and Government buildings, department stores and shops, banks and offices for commercial and professional development, headquarters for regional organisations, theatre, library, museum, art gallery, church, a college of further education, cinemas, hotels, restaurants, and cafes. The New Town is being developed to house an ultimate population of 80,000, and to serve a surrounding population of 200,000.

An attractive brochure of 32 quarto pages, entitled *Harlow for Industry*, published by the Harlow Development Corporation, reviews the progress already made in the development of that interesting New Town 23 miles north of London, and indicates what it is hoped to achieve in the next decade. Primarily, as its title implies, the brochure aims at attracting industry to the New Town, in which 100 acres of the Eastern Industrial Estate are already opened up for development, with all services available, and nearly 50 factory units in production. On the Western Industrial Estate 95 acres are being laid out for development, and factories of all sizes are to let on short or long leases. Sites for private development are also to let on long lease.

Gas supply to the New Town is the responsibility of the Eastern Gas Board. To take the gas from the Ponders End works, seven miles away, a 12 in. steel high pressure main has been laid across open country, and provision is made for gas supply in all factory premises. The Industrial Section of the Gas Board has devoted special attention to the installation of pipework and appliances for industrial processes, factory heating, hot water, and canteen equipment.

The brochure refers to first class living and working conditions in 'a town in the country, free from smog, congestion, and travel problems, and with conditions conducive to high output, and health of workers and their families.' Apart from a few flats, interior domestic heating is by means of a gas-ignited smokeless fuel fire grate in the living room, which also heats the water. Tenants have free choice of gas or electricity for cooking and other domestic purposes. A standard gas wash boiler is provided in every dwelling unless the tenant already possesses one or prefers to purchase another type of his own choice. Kitchens have concealed gas and water supplies to a prefabricated fitting for a sink water heater, and points are provided for gas refrigeration where there is space, and in houses with larger-than-average halls points are provided for gas radiators and space heaters.

Why the Town is being Built

Harlow is being built to assist in the dispersal of industry and people from London. Industry in Harlow will no longer bear the uneconomic burden imposed by ever-increasing traffic chaos and congestion in the metropolis.

Among the firms already established in Harlow, a number have recorded an improvement in productivity. To what extent this is due to the improved health of the workers or is attributable to improved factory design and layout, is not yet known. But it is significant that one large firm of international repute, which can directly compare productivity in its London and Harlow factories, records such an improvement in output at its Harlow factory that it is considering its extension to take the balance of its London works and the addition of a new unit.

Housing for All

Firms moving to Harlow have brought a large proportion of their labour force with them. Recruitment is easy because of the attraction of housing accommodation to which everyone working in the town is entitled. Industrialists say that their workers are contented and sickness and absenteeism are low.

The Corporation undertakes to provide a suitable dwelling for every worker or executive moving with his firm, and for additional employees recruited through the machinery of the labour exchanges. The industrialist may, therefore, be assured that workers coming with the firm or subsequently engaged will be housed in excellent conditions.

Amenities of the Town

Harlow has already attracted people drawn from all sections of the community. To cater for their differing tastes, needs and incomes, the Corporation has planned or is building nearly 150 different house types, including detached and semi-detached houses, and a limited number of flats. Accommodation varies from a self-contained bed-sitting room with all amenities to a five-bedroomed house.

The site of the town comprises two valleys, one running east/west and the other north/south, and these divide the town naturally into four quarters or major neighbourhoods. Each of these will have a population of about 20,000 disposed about the site of the town centre, where, commencing in April, a range of shops, including departmental stores, will be built. The town centre will have offices for professional and commercial services, hotels, theatres, cinemas, and the civic and cultural buildings necessary for a self-contained town of the size and character contemplated.

The four major neighbourhood units will each contain within their boundaries many of the amenities necessary for the daily life of the residents. The first of these neighbourhoods, Mark Hall and Netteswell, is advancing to completion and already has 50 shops, primary schools, licensed premises, a health centre, cinema, community centre, churches, playgrounds, sports and playing fields. A number of the latter have been provided by the Corporation and leased to works clubs from the new factories, but already some of the larger industrialists are arranging to develop their own private sports grounds on land leased from the Corporation.

The first new primary school has been in occupation for some time. Four primary schools are under construction, three of which will be completed in 1954, as will the first secondary modern and technical school.

In view of the highly skilled work carried out in many of the factories moving into Harlow, it is recognised that facilities for technical education and day release classes are essential. To meet this need the local education authority proposes to establish a college of further education in the town centre and it is hoped that the building of this will start within the next few years.

COMPANY NEWS

POWELL DUFFRYN—COPPEE

Powell Duffryn, Ltd., and the Coppee Co. (Great Britain), Ltd., announce the formation of a jointly owned company to be called Powell Duffryn-Coppee, Ltd., for the purpose of co-operation between the two Companies in the securing of contracts for the installation of Coppee coke oven plant in Great Britain and the Commonwealth.

BABCOCK AND WILCOX

The directors of Babcock & Wilcox Ltd., state that the first interim payment on the £4,000,000 4½% debenture stock, 1980, will be made on March 31. On stock fully paid on allotment, the payment will be £2 0s. 4d.%, less tax. On all other stock, the payment will be £1 14s. 7d.%, less tax. These payments will be made to stockholders on the register on March 15.

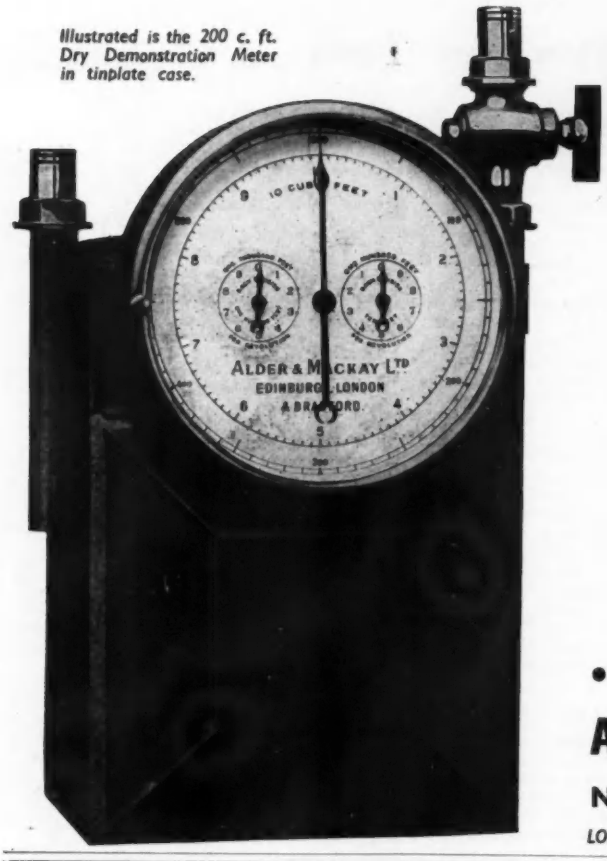
INTERNATIONAL COMBUSTION

The directors of International Combustion (Holdings), Ltd., are recommending a final dividend of 15%. This makes a total of 20% on the present £1,918,490 ordinary as increased by 100% free scrip issue. For the previous year a similar total was paid, but included an interim of 10% on the smaller capital existing prior to the free scrip issue. Group untaxed profits rose from £1,580,403 to £1,627,916, and the net figure is up by £63,580 at £528,222.

UNITED GAS INDUSTRIES

United Gas Industries, Ltd., are reducing the interim dividend from 5% to 3½% in respect of the year ending March 31 next, and with the declaration is a statement from Lieut.-Col. W. Cabourn Smith, Chairman, explaining reasons for the decision. In his 1952 and 1953 annual statements he warned shareholders of the possibility of a recession in trade. This recession occurred during the current year and its effect on profits was aggravated by the cost of an extra week's paid holiday and two increases in wages. Unfortunately all these additional costs have had to be met by the company with little prospect of passing them on to the consumer; consequently, reduced margins on a lower volume of sales are having an adverse effect on profits. 'The situation is therefore one which calls for the greatest caution,' states Lieut.-Col. Smith. 'I am able to say that there has been some slight revival in trade during the past few months, but nevertheless my board do not feel justified in maintaining the interim.' Without attempting to forecast the future, Lieut.-Col. Smith is confident of the company's ability to weather this recession.

Illustrated is the 200 c. ft. Dry Demonstration Meter in tinplate case.



IMPORTANT MEASURES

The 'A & M' DRY DEMONSTRATION METER

This meter is particularly useful for cookery or other demonstration purposes. The dial is 9" in diameter, and the meter is available in a variety of sizes. Complete details will be sent on request.

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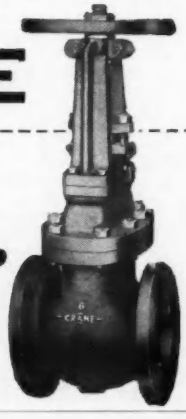

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Subscription Rates: Home and Empire:—52/- per annum; Foreign:—60/- per annum. (Both payable in advance.) A copy of the "Gas Journal" Calendar & Directory is presented each year to continuous subscribers.

Classified Advertisements: All small classified advertisements are charged at 1/9 per line (approx. 7 words)—minimum charge 10/6. A Box Number address occupies 2 lines, and a further 6d. is charged towards cost of postage on replies. Copy must be received by first post on Monday to ensure insertion in that week's Journal.

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APPOINTMENTS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

WEST MIDLANDS GAS BOARD

BIRMINGHAM & DISTRICT DIVISION

DRAUGHTSMEN

FOUR VACANCIES exist for DRAUGHTSMEN on the staff of the Divisional Engineer.

Candidates for the positions should have good Engineering Drawing Office experience.

The salaries for the posts will be within Grades V (£480-£560 per annum), VI (£510-£590 per annum), and VII (£565-£645 per annum), of the National Salary Scales for Gas Staffs.

The posts are pensionable and the successful candidates may be required to pass a medical examination.

Candidates must state the grade of the position for which they make application. Applications, giving age, present position, experience, general and technical education and certificates held, together with the names of two referees, should be addressed to Mr. J. E. Wakeford, Divisional General Manager, West Midlands Gas Board, Birmingham and District Division, Gas Offices, Edmund Street, Birmingham, 3, to reach him within fifteen days of the appearance of this advertisement.

F. H. CURETON.
Secretary to the Board.

EAST MIDLANDS GAS BOARD

LEICESTER AND NORTHANTS. DIVISION

APPOINTMENT OF

HOME SERVICE ADVISER—

LEICESTER GROUP

APPLICATIONS are invited for the position of HOME SERVICE ADVISER with the Leicester Group. Salary range £300-£448 per annum, the commencing salary to be commensurate with the capabilities of the successful candidate.

Candidates must be capable of working independently and be in possession of a recognised Diploma in Cookery and/or Domestic Science. They should be proficient in the practical demonstration of gas cooking, laundering and other appliances, and be able to advise consumers on all domestic problems involving the use of gas in the home.

The person appointed may be required to pass a medical examination, and unless already subject to a pension scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Board's Staff Pension Scheme within six months from taking up the appointment.

Applications stating age, experience and present position, and giving full particulars of training and qualifications, together with the names of two referees, should reach the undersigned not later than Wednesday, March 10, 1954.

H. B. TAYLOR,
Divisional General Manager.

Gas Offices,
Millstone Lane,
Leicester.
February 18, 1954.

CALOR GAS (DISTRIBUTING) CO., LTD. require suitably qualified person for services as LECTURER with a mobile training unit. Applicants should preferably reside in the home counties, have experience in teaching (such as part-time evening school). Qualifications should include recognised gas certificate. The appointment involves regular travelling in the United Kingdom and is probably more suitable for an unmarried man, but married applicants will be considered. Prior training will be given. The appointment is pensionable (non-contributory) after suitable qualifying period. Commencing salary from £550-£600 per annum, according to experience and qualifications. Reply in first instance, giving full details of age, marital status, qualifications and experience to The Chief Engineer, Research and Development Division, Coombelands, Addlestone, Surrey, Marking envelope "Lecturer," before March 31, 1954.

EASTERN GAS BOARD

WATFORD DIVISION

INDUSTRIAL GAS ENGINEER

APPLICATIONS are invited for the position of an INDUSTRIAL GAS ENGINEER in the Watford Division. Applicants should have had experience in the design, construction and installation of industrial and commercial plant covering a range of representative industries and should be suitably qualified by examination.

The commencing salary will be within Grade XI A.P.T. ('Fringe' Metropolitan) placing according to experience.

The successful candidate may be required to pass a medical examination, and unless already subject to a pension scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Board's Staff Pension Scheme within six months from taking up the appointment.

Applications stating age and giving full particulars of education, training, qualifications and experience should be sent not later than March 15 to the General Manager, Eastern Gas Board, Watford Division, Radiant House, Clarendon Road, Watford, Herts.

SCOTTISH GAS BOARD

FIFE GROUP

DUNFERMLINE DISTRICT

TECHNICAL ASSISTANT

APPLICATIONS are invited for the position of TECHNICAL ASSISTANT to the above Group.

The salary will be Grade A.P.T. VII-IX, Provincial 'A', minimum £565, maximum £735 with placing according to qualifications and experience.

Candidates should have experience in Gas Engineering and possess the Higher Grade certificate in Gas Engineering (Manufacture). Experience in Vertical and Horizontal Retorts will be an advantage.

The post is pensionable and the successful applicant may be required to pass a medical examination.

Applications endorsed "Technical Assistant" giving full particulars of age, qualifications and experience, together with *copies* of three recent Testimonials, or names and addresses of three referees to whom reference can be made, to be lodged with the undersigned not later than March 10, 1954.

DAVID L. DICKSON,
Group Manager.

Scottish Gas Board,
Gas Offices,
Grange Road,
Dunfermline.

(*Classified Advertisements continued on page* 494)

APPOINTMENTS VACANT (ctd.)

WALES GAS BOARD
SWANSEA UNDERTAKING

FIRST-CLASS GAS FITTERS urgently required. Full J.I.C. Rates of Pay (Provincial 'A') and Conditions of Service.

Applications stating age, details of qualifications, etc., should be forwarded to the General Manager and Engineer, Wales Gas Board, Swansea Undertaking, Oystermouth Road, Swansea.

February 12, 1954.

WALES GAS BOARD
KIDWELLY UNDERTAKING

APPLICATIONS are invited for the appointment of a qualified GAS FITTER to serve the above Undertaking. A house will be available at a reasonable rental to the successful applicant.

The rate of pay will be in accordance with Joint Industrial Council Agreement covering Provincial 'B' Undertakings.

Applications stating age, qualifications and experience should be forwarded to reach the undersigned before March 3, 1954.

D. W. REES,
Engineer and Manager.

Llanelly and Gowerton Undertakings,
Gas Offices,
Murray Street,
Llanelly.
January 26, 1954.

WALES GAS BOARD
CAERNARVON UNDERTAKING—
WORKS SUPERINTENDENT

APPLICATIONS are invited from suitably qualified personnel for the above-mentioned position. The rate payable will be within the range of Grade VII (£455-£500 per annum). Intermediate Grade.

Accommodation is available at a reasonable rent.

Applicants should have good all-round gas works experience especially with regard to Horizontal Retorts. Some experience with the Tully Complete Gasification Plant and Electrical Machinery, will be an advantage. Ability to control labour and to organise are essential qualifications.

Applications, stating age and experience (Manufacture and Supply), accompanied by the names of two referees, should be addressed to the undersigned in a plain envelope endorsed 'Works Superintendent' to be received not later than March 3, 1954.

A. MAWSON,
Engineer and Manager.

Gas Offices,
8, Eastgate Street,
Caernarvon.

NORTHERN GAS BOARD
MIDDLESBROUGH DIVISION
MANAGER—REDCAR UNIT

APPLICATIONS are invited for the above appointment.

Applicants should be qualified Gas Engineers and have good general experience.

The salary for the post will be in accordance with Grade XI of the National Salary Scales (£715 × £25-£840) and the successful applicant will be required to pass a medical examination and be subject to the provisions of the Board's staff Superannuation Scheme.

Applications stating age, education, training and present position, together with the names of two referees should be addressed to the undersigned, so as to reach him not later than first post on Saturday, March 6, 1954.

JOHN W. PALLISTER,
Divisional General Manager.

Commercial Street,
Middlesbrough.
February 17, 1954.

SOUTH EASTERN GAS BOARD
DESIGN DRAUGHTSMEN,
CENTRAL CONSTRUCTION DEPARTMENT,
OLD KENT ROAD, S.E.15

APPLICATIONS are invited from DESIGN DRAUGHTSMEN for vacancies in the Central Construction Department of the Board.

Applicants should have a sound engineering training and have experience in the design and construction in any of the following branches of work—Coal Carbonising and Gasification Plant, By-Product Plant, Materials Handling Plant, Reinforced Concrete Structures, Structural Steelwork and Steam and Power Plant.

Salary within the ranges £635-£715 p.a. or £665-£765 p.a. according to qualifications and experience.

Applications, quoting reference V10/378, and giving full details, should reach the undersigned not later than fourteen days after the publication of this notice.

R. J. MCCRAE,
Personnel Manager.

Katharine Street,
Croydon.

PATENTS

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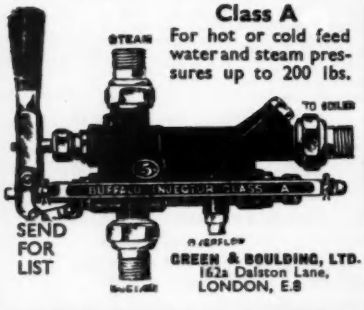

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'Phone: Northern 0989. 'Grams: Reckoners, B'ham.

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interest in a given commodity and enhance the potential of the Sales Staff. They can be used in a far more realistic way than black and white photographic prints to show off heavy machinery or a factory site. Understanding of blue-prints, service manuals, and the arrangement of complex machinery, cabling, piping, and lagging, to mention but a few examples, is made straightforward with the aid of 3-D colour slides. The foregoing remarks are addressed to the go-ahead Sales Managers, Maintenance Equipment Officers, P.R.O.s, and Publicity Managers. It will not cost them more than a 'phone call or a 2½d. stamp to find out more about this medium which is an up-to-date rendering of a very old principle. Enquiries to: **Walter King Photography, 11, Bolt Court, London, E.C.4.**, who are always in the lead with the latest developments of photography. And to firms whose policy it is to present regular pictures by means of projected slides, we have also something to offer—on 3-D lines of course!

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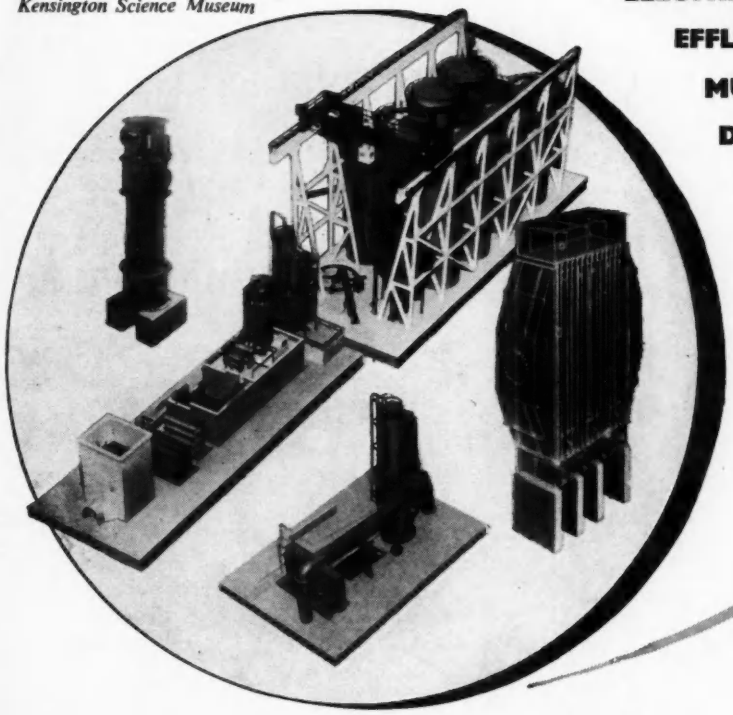
Models illustrated with acknowledgment to South Kensington Science Museum



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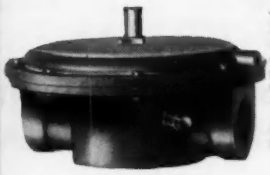

THE SINGLE DIAPHRAGM AUTOMATIC SHUT-OFF VALVE *(illustrated left) automatically closes the gas supply in the event of pressure dropping below a predetermined point. Not until all burner cocks on the outlet have been shut and gas pressure restored is it possible to re-open the valve. This appliance is for operation on systems handling 150 to 2,400 cub. ft. of low pressure gas per hour.*

THE AUTOMATIC CUT-OFF SWITCH, *illustrated right, automatically breaks the electric supply to motor-driven gas boosters or compressors if low pressure gas falls below a predetermined pressure.*
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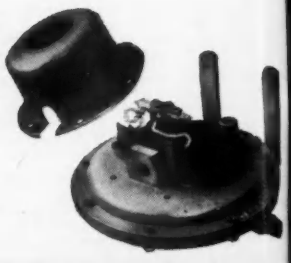
Additional applications include its use as (a) an air flow switch in conjunction with a flame failure device and (b) a gas meter protector.



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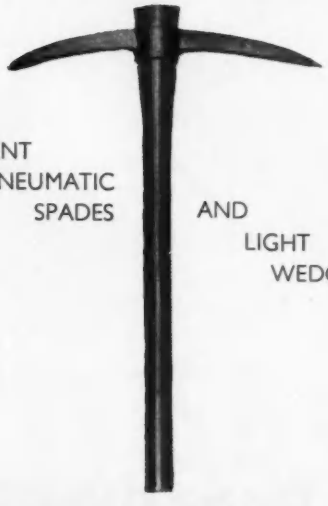

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